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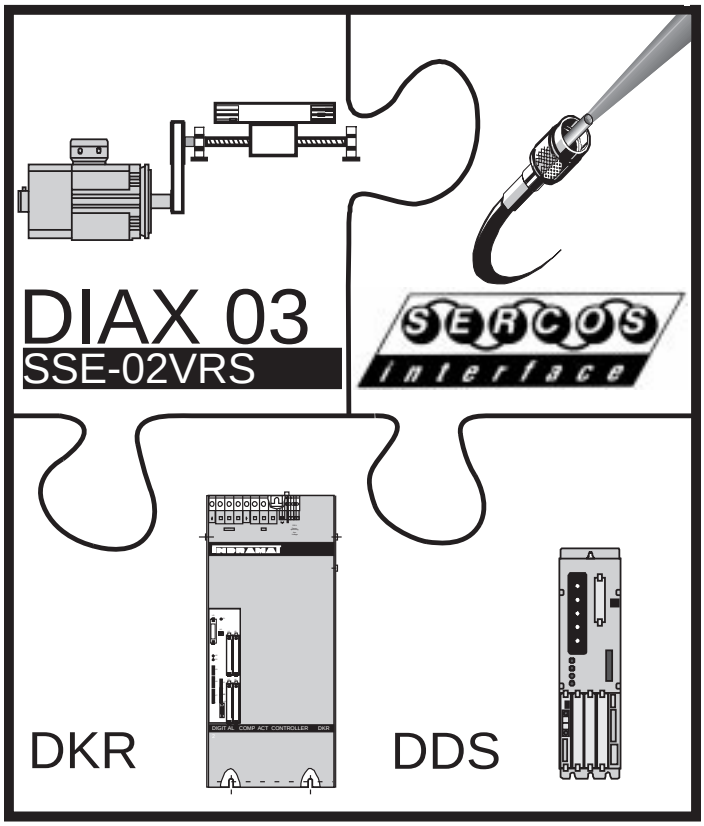

DIAX03

Drive With Servo Function

Functional Description: SSE 02VRS

DOK-DIAX03-SSE-02VRS**-FKB1-EN-P

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What is the purpose of this documentation?

The following documentation describes the functions of the firmware FWA-DIAX03-SSE-02VRS.

This documentation serves trained maintenance personnel:

- as a working guide for installation of the digital AC servo drive via a SERCOS-compatible control system
- for parameterization of the drive controller
- for data security of the drive parameter
- for error diagnosis and error removal

Course of modifications

Document identification of previous and present output	Release Date	Remarks
DOK-DIAX03-SSE-02VRS**-FKB1-EN-P	10.97	First edition

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Supplement A: Parameter Description

Supplement B: Diagnostic Message Description

Customer Service Locations

1 System Overview

1.1 Range of Applications

DIAX03 is a family of digital, intelligent drives. DIAX03 offers solutions for applications in the following markets:

- Tool machines
- Converting
- Printing
- Packaging
- General industrial Automation

DIAX03 consists of:

- A standardized digital drive SERCOS interface
- Operation with the complete line of INDRAMAT motors
- Complete power range from 1kW to 100kW
- User-friendly software features
- Adaptability to various applications by configuring the drive with optional plug-in cards

1.2 Drive Controllers

The DIAX03 family consists of five drive controllers:

Modular Digital Servo Drives (Drive Controllers):

- DDS2.2
- DDS3.2

Digital Vector Drives for with integrated power input (rectifier) and regenerative power feedback:

- DKR2.1
- DKR3.1
- DKR4.1

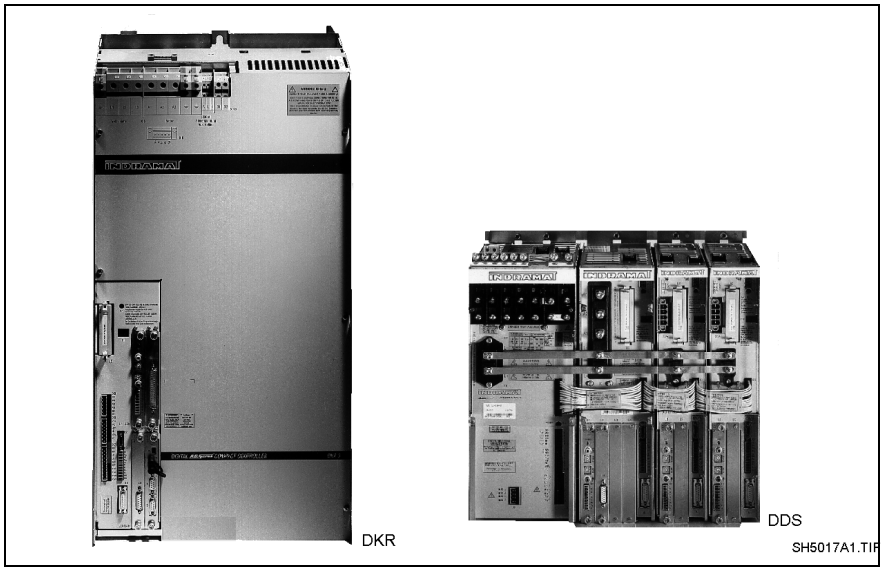


Fig. 1-1: Drive controllers

The type of the digital drive used is stored in parameter **S-0-0140, Controller type**.

1.3 Motors

Rotary and linear motors can be driven with the DIAX03 drive family.

Rotary motors:	Linear motors:
MDD	LAR
MKD	LAF
2AD	LSF
ADF	
1MB	
MBW	
MBS	

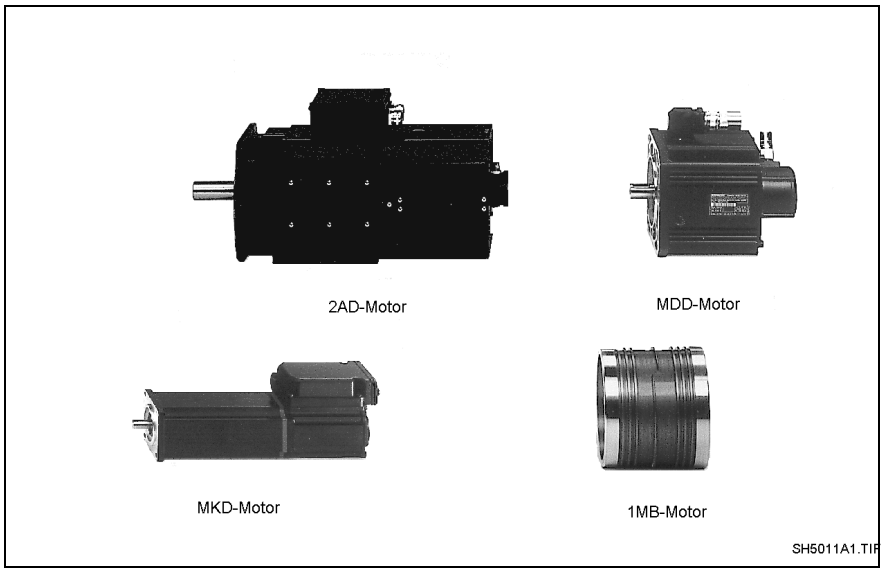


Fig. 1-2: Rotary motors

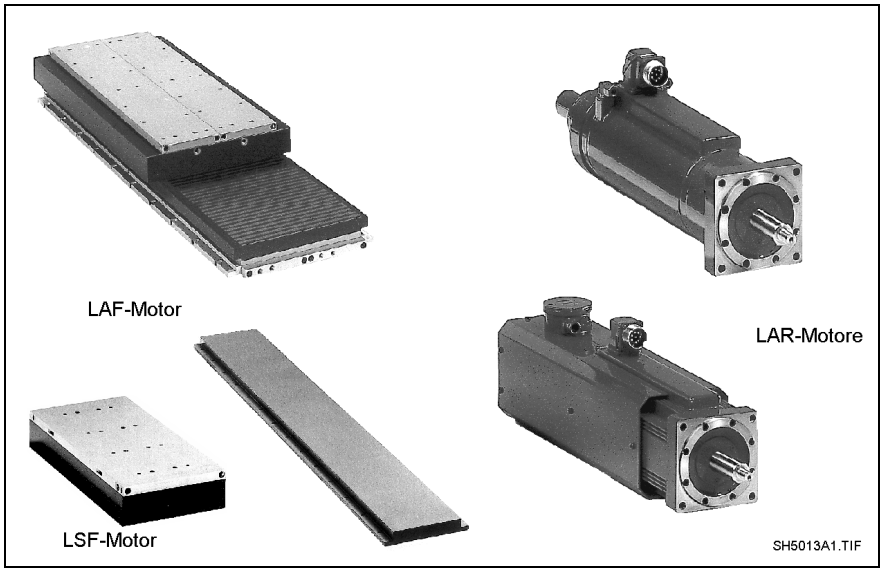


Fig. 1-3: Linear motors

The motor type used is stored in parameter **S-0-0141, Motor type**.

1.4 Firmware Overview

Within the DIAX03 family, there are three user-specific firmware variations:

- Drive with servo functionality
- Drive with main spindle functionality
- Drive with electronic line shafting functionality

The drive with electronic line shafting function (servo feature) is described in the following documentation.

The software version used is stored in the parameter **S-0-0030, Manufacturer version**.

1.5 Basic Operating Modes and General Features

Basic Operating Modes

- Torque mode
- Velocity mode
- Position mode
- Drive-interpolated position mode
- Relative drive-internal interpolation

General Features

- Diagnostic possibilities
- Setting of torque/force limits
- Current limit
- Limiting the velocity
- Travel range limit
- Drive error reaction:
  - P-0-0119, Best Possible Deceleration
    Velocity command switched to zero
  - Best possible deceleration (torque disable)
  - P-0-0119, Best Possible Deceleration
    Velocity command switched to zero with ramp (slope) and filter
  - NC Response on Error
  - Emergency stop feature
- Control loop settings
  - Load default feature
  - Acceleration feed forward
  - Velocity mix factor
  - Velocity preset control
- Language selection

- Drive interlock
- Drive halt
- Drive-controlled homing procedure
- Evaluating absolute measurement systems by setting the absolute measurement
- Analog output
- Oscilloscope feature
- Measuring feature with:
  - Measuring signal actual feedback value 1/2
  - Measuring signal time
- Modulo feature
- Error storage and operating hour counter
- Configurable signal status word
- Customer password
- Command parking axis
- Settable drive-internal position resolution

1.6 Additional Firmware Features: Drive with Servo Feature

- Axis error compensation
- Consideration of reversal clearance
- Positive stop drive procedure
- Frictional torque compensation

Notes

2 Safety Instructions for Electrical Drives

2.1 General

These instructions must be read and understood before the equipment is used to minimize the risk of personal injury and /or property damage. Follow these safety instructions at all times.

Do not attempt to install, use or service this equipment without first reading all documentation provided with the product. Please read and understand these safety instructions, and all user documentation for the equipment, prior to working with the equipment at any time. You must contact your local Indramat representative if you cannot locate the user documentation for your equipment. A listing of Indramat offices is supplied in the back of this manual. Request that your representative send this documentation immediately to the person(s) responsible for the safe operation of this equipment.

If the product is resold, rented and/or otherwise transferred or passed on to others, these safety instructions must accompany it.

WARNING

Improper use of this equipment, failure to follow the attached safety instructions, or tampering with the product, including disabling of safety device, may result in personal injury, severe electrical shock, death, or property damage!

INDRAMAT GmbH is not liable for damages resulting from failure to observe the warnings given in these instructions.

- Operating, maintenance and safety instruction in the appropriate language must be ordered and received before initial start-up, if the instructions in the language provided are not understood perfectly.
- Proper and correct transport,storage, assembly, and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Trained and qualified personnel:

  Only trained and qualified personnel may work on this equipment or in its vicinity. Personnel is qualified if they have sufficient knowledge of the assembly, installation, and operation of the product as well as of all warnings and precautionary measures noted in these instructions.

  Furthermore, they should be trained, instructed, and qualified to switch electrical circuits and equipment on and off, to ground them, and to mark them according to the requirements of safe work practices and common sense. They must have adequate safety equipment and be trained in first aid.
- Use only spare parts approved by the manufacturer.
- All safety regulations and requirements for the specific application must be followed as practiced in the country of use.
- The equipment is designed for installation on commercial machinery.
- Start-up is only permitted once it is sure that the machine in which the products are installed complies with the requirements of national safety regulations and safety specifications of the application.

  European countries: see Directive 89/392/EEC (Machine Guideline);

- Operation is only permitted if the national EMC regulations for the application are met.

  The instructions for installation in accordance with EMC requirements can be found in the INDRAMAT document "EMC in Drive and Control Systems“.

  The machine builder is responsible for the adherence of the limiting values as prescribed in the national regulations and specific regulations for the application concerning EMC.

  European countries: see Directive 89/336/EEC (EMC Guideline);

  U.S.A.: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.
- Technical data, connections, and operational conditions are specified in the product documentation and must be followed.

2.2 Protection against contact with electrical parts

Note: This section pertains to equipment and drive components with voltages over 50 Volts.

Touching live parts with potentials of 50 Volts and higher applied to them can be dangerous and cause severe electrical shock. In order for electrical equipment to be operated, certain parts must have dangerous voltages applied to them.

DANGER

High Voltage!

Danger to life, severe electrical shock and risk of injury!

⇒ Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain and/or repair this equipment.

⇒ Follow general construction and safety regulations when working on electrical installations.

⇒ Before switching on power, the ground wire must be permanently connected to all electrical units according to the connection diagram in the Project Planning Manual.

⇒ At no time may electrical equipment be operated if the ground wire is not permanently connected, even for brief measurements or tests.

⇒ Before beginning any work, disconnect mains or the voltage source from the equipment. Lock the equipment against being switched on while work is being performed.

⇒ Wait 5 minutes after switching off power to allow capacitors to discharge before beginning work. Measure the voltage on the capacitors before beginning work to make sure that the equipment is safe to touch.

⇒ Never touch the electrical connection points of a component while power is turned on.

⇒ Before switching the equipment on covers and

guards provided with the equipment must be installed to prevent contact with live parts. Before operating cover and guard live parts properly so they cannot be touched.

⇒ A leakage current protective device must not be used for an AC drive! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.

European countries: according to EN 50178/ 1994;

⇒ Electrical components with exposed live parts must be installed in a control cabinet to prevent direct contact.

European countries: according to EN 50178/ 1994;

⇒ U.S.A: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

DANGER

High discharge current!

Danger to life, risk of severe electrical shock and risk of injury!

⇒ All units and the motors must be connected to a grounding point with the ground wire or must be grounded themselves before switching on power.

⇒ The discharge current is greater than 3.5 mA. A permanent connection to the supply system is therefore required for all units.

European countries: according to EN 50178/1994, section 5.3.2.3;

⇒ U.S.: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

⇒ The ground wire must always be connected before start-up, even during the performance of tests. Otherwise, high voltages may be present at the unit housing, which can result in severe electrical shock and personal injury.

2.3 Protection by protective low voltage (PELV) against electrical shock

All connections and terminals with voltages ranging between 5 and 50 volts on INDRAMAT products are protective low voltages designed in accordance with the following standards on contact safety:

- International: IEC 364-4-411.1.5
- European countries within the EU: see EN 50178/1994, section 5.2.8.1.

WARNING

High electrical voltages due to incorrect connections!

Danger to life and limb, severe electrical shock and/or serious bodily injury!

⇒ Only that equipment or those electrical components and cables may be connected to all terminals and clamps with 0 to 50 volts if these are of the protective low voltage type (PELV = Protective Extra Low Voltage).

⇒ Only connect those voltages and electrical circuits that are safely isolated. Safe isolation is achieved, for example, with an isolating transformer, an optoelectronic coupler or when battery-operated.

2.4 Protection against dangerous movements

Dangerous movements can be caused when units have bad interfaces or motors are connected incorrectly.

There are various causes of dangerous movements:

- Improper or incorrect wiring or cable connections
- equipment is operated incorrectly
- probe parameters or encoder parameters are set incorrectly
- broken components
- errors in software or firmware

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

Although the monitoring circuits in the drive components make improper operation almost impossible, personnel safety requires that proper safety precautions be taken to minimize the risk of electrical shock, personal injury and/or property damage. This means that unexpected motion must be anticipated since safety monitoring built into the equipment might be defeated by incorrect wiring or other faults.

DANGER

Dangerous movements!

Danger to life, electrical shock and risk of injury or equipment damage!

⇒ In the drive component monitoring units, every effort is made to avoid the possibility of faulty operation in connected drives. Unintended machine motion or other malfunction is possible if monitoring units are disabled, by-passed or not activated.

⇒ Safe requirements of each individual drive application must be considered on a case-by-case basis by users and machine builders.

Avoiding accidents, electrical shock, personal injury and/or property damage:

⇒ Keep free and clear of the machine's range of motion and moving parts. Prevent people from accidentally entering the machine's range of movement:

- use protective fences
- use protective railings

- install protective coverings
- install light curtains

⇒ Fences should be strong enough to withstand maximum possible momentum.

⇒ Mount the Emergency Stop (E-Stop) switch in the immediate reach of the operator. Verify that the Emergency Stop works before start-up. Do not use if not working.

⇒ Isolate the drive power connection by means of an Emergency Stop circuit or use a safe lock-out system to prevent unintentional start-up.

⇒ Make sure that the drives are brought to standstill before accessing or entering the danger zone.

⇒ Disconnect electrical power to the equipment using a master lock-out and secure against reconnection for:

- maintenance and repair work
- cleaning of equipment
- long periods of discontinued equipment use

⇒ Avoid operating high-frequency, remote control, and radio equipment near equipment electronics and supply leads. If use of such equipment cannot be avoided, verify the system and the plant for possible malfunctions at all possible positions of normal use before the first start-up. If necessary, perform a special Electromagnetic Compatibility (EMC) test on the plant.

2.5 Protection against magnetic and electromagnetic fields during operations and mounting

Magnetic and electromagnetic fields in the vicinity of current-carrying conductors and permanent motor magnets represent a serious health hazard to persons with heart pacemakers, metal implants and hearing aids.

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

⇒ Persons with pacemakers and metal implants are not permitted to have access to the following areas:

- Areas in which electrical equipment and parts are mounted, operating or are being commissioned.
- Areas in which parts of motors with permanent magnets are being stored, repaired or mounted.

⇒ If it is necessary for a person wearing a heart pacemaker to enter into such an area then a physician must be consulted prior to doing so.

⇒ Persons with metal implants or hearing aids must take care prior to entering into areas described above. It is assumed that metal implants or hearing aids will be affected by such areas and a physician must be consulted prior to doing so.

2.6 Protection during handling and installation

All INDRAMAT products should be handled and assembled according to the instructions in the documentation.

CAUTION

Risk of injury due to incorrect handling!

Bodily injury caused by crushing, shearing, cutting, and thrusting movements!

⇒ Observe installation instructions and safety regulations before handling and working on the product.

⇒ Use suitable installation in using lifting or moving equipment. Refer to the user manual for the product.

⇒ Take precautions to avoid pinching and crushing.

⇒ Only use suitable tools specified in the user manuals and use them according the instructions.

⇒ Use lifting devices and tools correctly and safely.

⇒ Wear appropriate protective clothing, e.g., protective goggles, safety shoes, protective gloves.

⇒ Never stand under suspended loads.

⇒ Clean up liquids form the floor to prevent personnel from slipping.

2.7 Battery safety

Batteries contain reactive chemicals. Incorrect handling can result in injury or equipment damage.

CAUTION

Risk of injury due to incorrect handling!

⇒ Do not attempt to reactivate dead batteries by heating or other methods (danger of explosion and corrosion).

⇒ Never charge batteries (danger from leakage and explosion).

⇒ Never throw batteries into a fire.

⇒ Do not take batteries apart.

⇒ Handle carefully. Incorrect extraction or installation of a battery can damage equipment.

Note: Environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air, and sea transport in the sense of the legal requirements (Danger of explosion). Dispose of batteries separately from other refuse. Observe the legal requirements in the country of installation.

3 General Instructions for Installation

3.1 Explanation of Terms

It is helpful to explain the terms used in this document so that they will be better understood.

Parameter

Communication with the drive occurs (with a few exceptions) with the help of parameters. They can be used for

- Setting the configuration
- Parameterizing the control/drive settings
- Accessing control/drive functions and commands
- Configuring the cyclic telegrams

A parameter is identified with its ID numbers

All of the drive's operating data are identified by ID numbers.

All the parameter ID numbers available in the drive are listed in parameter **S-0-0017, IDN List of all Operation Data**.

The Data Status

Each parameter is provided with a data status, which can also be read. It serves the following purposes:

- Identifying the validity/invalidity of the parameter
- Contains the command acknowledgment if the parameter acts as a command (see Commands)

Data Block Structure

Each parameter has 7 different data block elements that can be read or written by a SERCOS control system.

Data Block Structure: Element No.:	Designation:	Remarks:
1	ID Number	Parameter identification
2	Name	can be changed in language selection
3	Attribute	contains data length, type and decimal places
4	Unit	can be changed in language selection
5	Minimum Input Value	contains the minimum input value of the operating data
6	Maximum Input Value	contains the maximum input value of the operating data
7	Operating Data	actual parameter value

Fig. 3-1: Data Block Structure

Changing the operating data depends on the communication phase

Only the operating data can be changed; all other elements can only be read. The operating data can be write-protected either continuously or temporarily.

Possible Error Messages when Reading and Writing the Operating Data

Error:	Reason:
0x7004, Data not changeable	The operating data is write-protected
0x7005, Data currently write-protected	The operating data cannot be written to in this communication phase (see Supplement A: Writing to Parameters)
0x7006, Data smaller than minimum value	The operating data is smaller than its minimal input value
0x7007, Data larger than maximum value	The operating data is larger than its maximum input value
0x7008, Data is not correct	The value could not be accepted as written because internal tests lead to a negative result
0x7009, data write protected with password	The parameter cannot be write accessed as customer password has been activated **S-0-0267, Password.** All parameters in **S-0-0192, IDN-List of backup operation data** can be conducted.

Fig. 3-2: Error messages while reading/writing operating data

Non-Volatile Parameter Storage Registers

All configuration and control settings are stored

Various non-volatile parameter storage registers that buffer operating data are contained in the drive. The operating data apply to:

- setting the configuration, or
- parameterizing the control drive settings

Each time operating data is written to it is stored.

Memory is available in the following structural component groups:

- Control drive
- Motor feedback (optional)
- Software module

Parameters Stored in the Digital Drive

All operating data that apply only to the drive controller and that cannot be changed by the user are stored in the digital drive. This consists of the following parameters:

- **S-0-0110, Amplifier Peak Current**
- **S-0-0112, Amplifier Nominal Current**
- **S-0-0140, Controller Type**
- **P-0-0518, Amplifier Nominal Current 2**
- **P-0-0519, Amplifier Peak Current 2**
- **P-0-4002, Current-Amplify-Trim Phase U**
- **P-0-4003, Current-Amplify-Trim Phase V**
- **P-0-4015, Intermediate Voltage**
- **P-0-4035, Trim-Current**

Parameter Storage in Motor Feedback

All motor-dependent parameters are stored in the motor feedback with MDD, MKD and MKE motors.

Additionally, parameters for the "load default" function and the motor feedback are stored here.

All parameters stored in the motor feedback data memory are there with both parameter block number 0 and 7. In parameter block 7 the original data without write access are stored in the motor feedback data memory. These are copied after powering up into the parameters of parameter block 0. The parameters of parameter block 0 take effect.

Parameters Stored in DSM Programming Module

By switching the programming module when devices are exchanged, the characteristics of the device that has been exchanged can be easily transferred to the new device.

Depending on the setting of SERCOS parameter **S-0-0269, Parameter buffer mode**, all the application parameters are either stored in programming module DSM 2.3 (EEPROM) or temporarily kept (RAM). These parameters are listed in the **S-0-0192, IDN-List of backup operation data**. In addition, parameters stored in the motor feedback of MDD, MKD or MKE motors are included in this list.

If programming modules are exchanged, these parameters must be read from the old module so that after the exchange they can be written to the new module.

Data Saving

To save the data of the axis, all important and changeable parameters of the axis are filed in the list **S-0-0192, IDN-List of backup operation data**. By saving the parameters listed there with the control/parametrization surface, you can obtain a complete data backup of this axis after the first setup.

Parameter Buffer Mode

The drive controller is capable of storing data that is transmitted via the service channel either temporarily (in RAM) or permanently (in the EEPROM).

The parameter **S-0-0269, Parameter buffer mode** determines what will be done with the parameters.

Password

All important axis-specific parameters are stored in the programming module. If, e.g., a controller is replaced because of a defect then the features can be transferred to the new controller by simply using the old module. The affected parameters are stored in **S-0-0192, IDN-List of backup operation data.** To secure these parameters against unwanted or non-authorized changes, the customer password can be activated.

Activating, changing and deactivating the customer password

The access of the password function is done with parameter **S-0-0267, Password.** At delivery, the customer password is not active. In this case, all axis-specific parameters can be changed. With a non-active password, the character string "007" is displayed in **S-0-0267, Password**. To **activate or change** a customer password, input the character string sequence

"old password", space, "new password", space, "new password"

in S-0-0267. With a non-active password, use "007" as the old password. With an activate password, the character string "***" is displayed in **S-0-0267, Password**. Then the parameters in **S-0-0192, IDN-List of backup operation data** can not be changed. To **deactivate** the password, input the character string sequence

"old password", space, "007", space, "007".

Note: Parameters stored in the motor feedback or drive controller data memory can generally not be changed by the user.

Basic parameter block

The drive parameters are fixed at delivery at the factory. By executing the command **P-0-4094, C800 Command Base-Parameter load** it is possible to reproduce this state at any time. The basic parameter block is constructed so that

- all optional drive functions are deactivated
- limit values for position are deactivated
- limit values for torque/force are set to high values
- and limit values for velocity and acceleration are set to lower values

Velocity control is the mode set.

Note: The basic parameter block does not guarantee a matching of the drive to the machine as well as, in some cases, to the motor connected and the measuring systems. The relevant settings must be made when first starting up the axis.

(See also: Basic drive functions and Commissioning Guidelines.)

Running the "load basic parameter block" function automatically

The drive firmware is on the U5 programming module in the form of both the IC2 and IC3 EEPROMS. In the event of a firmware exchange, the drive controller will detect this the next time the machine is switched on. In this case, the message "**PL**" appears on the 7-segment display. By pressing the "S1" key, the basic parameter block is activated.

Note: Previously existing parameter settings are lost with a firmware replacement followed by "load basic parameter block" function. To prevent this, secure the parameters prior to replacement and reload them after replacement.

Operating Modes

Operating modes define which command values will be processed in which format, leading to the desired drive motion. They do not define how these command values will be transmitted from a control system to the drive.

One of the four selectable operating modes is active when the control and power supply is ready for operation and the controller enable signal is positive.

The drive displays **"AF"** in the H1 display.

All implemented operating modes are stored in parameter **S-0-0292, List of all operation modes.**

Error

Many areas are monitored in connection with operating modes and parameter settings. An error message is generated if a condition is encountered which no longer allows proper operation

Error Classes

The error class is evident from the diagnostic message.

Errors are separated into four different error classes. They determine the drive's error response.

Error Class:	Diagnostic Message:	Drive Response:
Fatal	F8xx	Torque free switching
Travel range	F6xx	Velocity command value switched to zero
SERCOS Interface	F4xx	In accordance with best possible deceleration
Non-fatal	F2xx	In accordance with best possible deceleration

Fig. 3-3: Error class divisions

Drive's Error Response

If an error state is detected in the drive, the drive's error response will automatically be executed as long as the drive is in control. The H1 display flashes Fx / xx. The drive's reaction to SERCOS interface and non-fatal errors can be parameterized with **P-0-0119, Best possible deceleration**. The drive switches to torque-free operation at the end of each error reaction.

Clearing Errors

Errors must be externally cleared.

Errors are not automatically cleared; they are cleared externally by:

Initiating the command **S-0-0099, C500 Reset class 1 diagnostic**
or Pressing the **"S1"** key.

If the error state is still present, then the error will be immediately detected again. A positive edge bit on the controller enable signal is necessary in order to turn the drive on.

Clearing Errors When Controller Enable Is Set

If an error is discovered while operating with set controller enable, the drive will execute an error response. The drive automatically deactivates itself at the end of each error response; in other words, the power stage is switched off and the drive switches from an energized to a de-energized state.

To reactivate the drive:

- clear the error
- enter a 0-1 edge bit into the controller enable

Note: To reactivate the drive after an error has been detected, not only must the error be cleared, but a 0-1 edge bit of the controller enable signal must also follow.
This function differs from the DIAX-02 series drives.

Error memory and operating hour counter

Once errors are cleared, they are stored in an error memory. The last 19 errors are stored there and the times they occurred. Simultaneously, there is an operating hour counter for control and power sections of the drive controller. This function has the following parameters:

- **P-0-0190, Operating hours control section**
- **P-0-0191, Operating hours power section**
- **P-0-0192, Error recorder diagnosis number**
- **P-0-0193, Error recorder, operating hours control section**

Warnings

Warnings do not cause automatic shutdowns

Many areas are monitored in connection with operating modes and parameter settings. A warning will be generated if a state is detected that allows proper operation for the time being, but will eventually generate an error and thereby lead to a shutdown of the drive if this state continues.

Warning Classes

The warning class is evident from the diagnostic message

Warnings can be separated into 2 classes. They are differentiated by whether the drive executes an automatic reaction when the warning appears.

Warning Class:	Diagnostic Message:	Drive Response:
With drive response	E8xx	Drive stop
Without drive response	E2xx	--

Fig. 3-4: Division of the Warning Classes

Warnings cannot be cleared externally.

Commands

Commands are used to control complex functions in the drive. For example, the functions "Drive-Controlled Homing Procedure" or "Transistion Check for Communication Phase 4" are defined as commands.

Each command that is started must also be cleared.

A primary control can start, interrupt or erase a command.

Each command has a parameter with which the command can be controlled.

While a command is being executed, the diagnostic message "Cx" or "dx" appears in the H1 display, where x is the number of the command.

All commands used are stored in parameter **S-0-0025, IDN-list of all procedure commands.**

Command Types

There are 3 command types.

- **Drive-Controlled Command**
  - Eventually leads to an automatic drive operation or motion
  - Can be started only when controller enable is set
  - Deactivates the active operating mode during its operation
- **Monitor Command**
  - Activates or deactivates monitors or features in the control drive
- **Management Command**
  - executes management tasks; is not interruptable

Command Input and Acknowledgment

Control and monitoring of command execution occurs via the command input and command acknowlegment. The command input tells the drive if the command should be started, interrupted or ended. The commanded value is the operating data of the applicable parameter. The command input value can be

- not set and enabled (0)
- interrupted (1)
- set and enabled (3)

The drive gives the current condition of the command execution in the acknowledgment. It is contained in the data status of the command parameter.

The condition can be

- not set and enabled (0)
- in process (7)
- error, command execution not possible (0xF)
- command execution interrupted (5)
- command properly executed (3)

The **Change Bit Command** in the **Drive Status Word** helps the control recognize a change in the command acknowledgment by the drive. The bit is set by the drive if the command acknowledgment changes from the condition in process (7) to the condition error, command execution not possible (0xF) or command properly executed (3). The bit is cleared if the master clears the input (0).

The control system will recognize if the drive sets the change bit. It can read the corresponding data status of the command or the command itself, which was set sometime but has not been cleared. The control system will recognize from this if the command ended with or without an error in the drive. Afterwards this command should be cleared by the control.

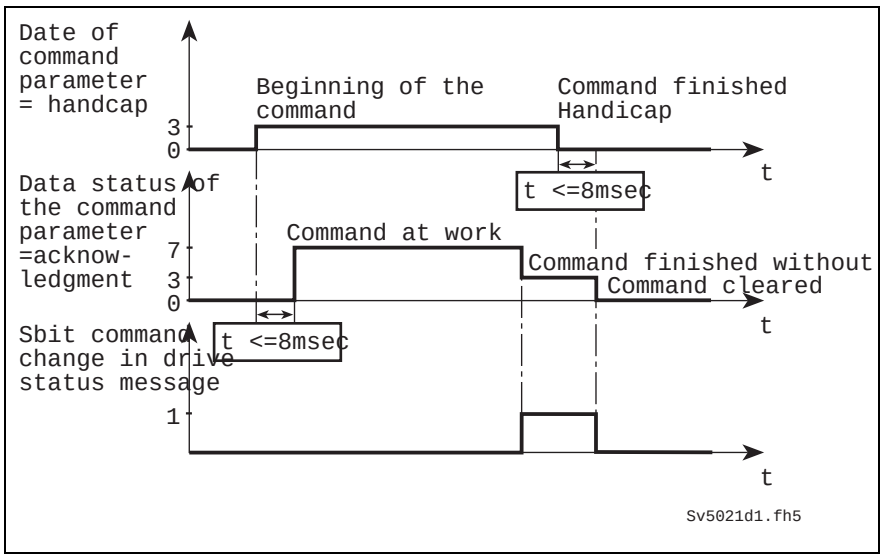


Fig. 3-5: Input, acknowledgment and Command Change Bit during proper execution

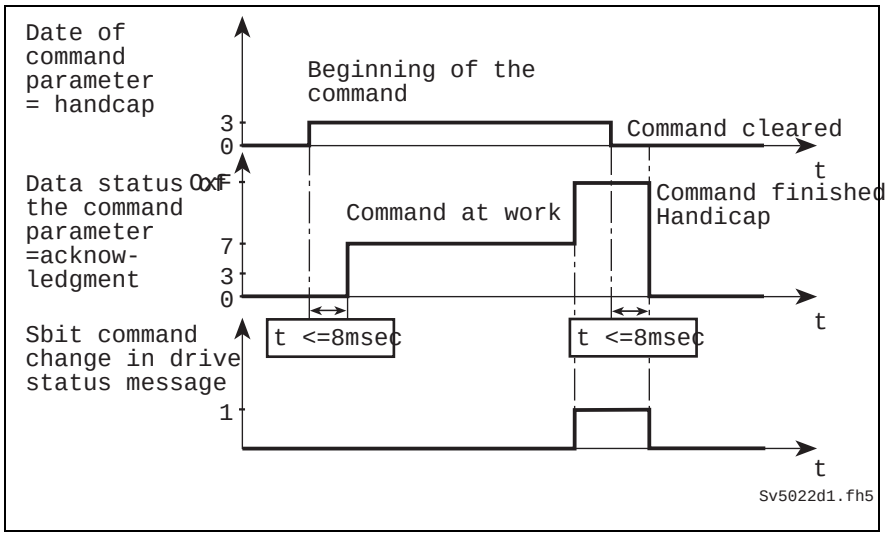


Fig. 3-6: Input, acknowledgment and KÄ bit during erroneous execution

A delay time of up to 8 ms can occur in the drive between receiving the command input and setting the command acknowledgment.

3.2 Commissioning Guidelines

To commission DIAX drive controllers parametrization interface SERCTOP with version SWA-S*TOP*-INB-04VRS is recommended.

Initial state is always

- a functioning communication via SERCOS interface to the drive and
- a standard wired and checked E-stop sequence.

The procedure for commissioning a drive controller is broken down into nine commissioning steps (IBS-1..9). The diagram depicts the sequence:

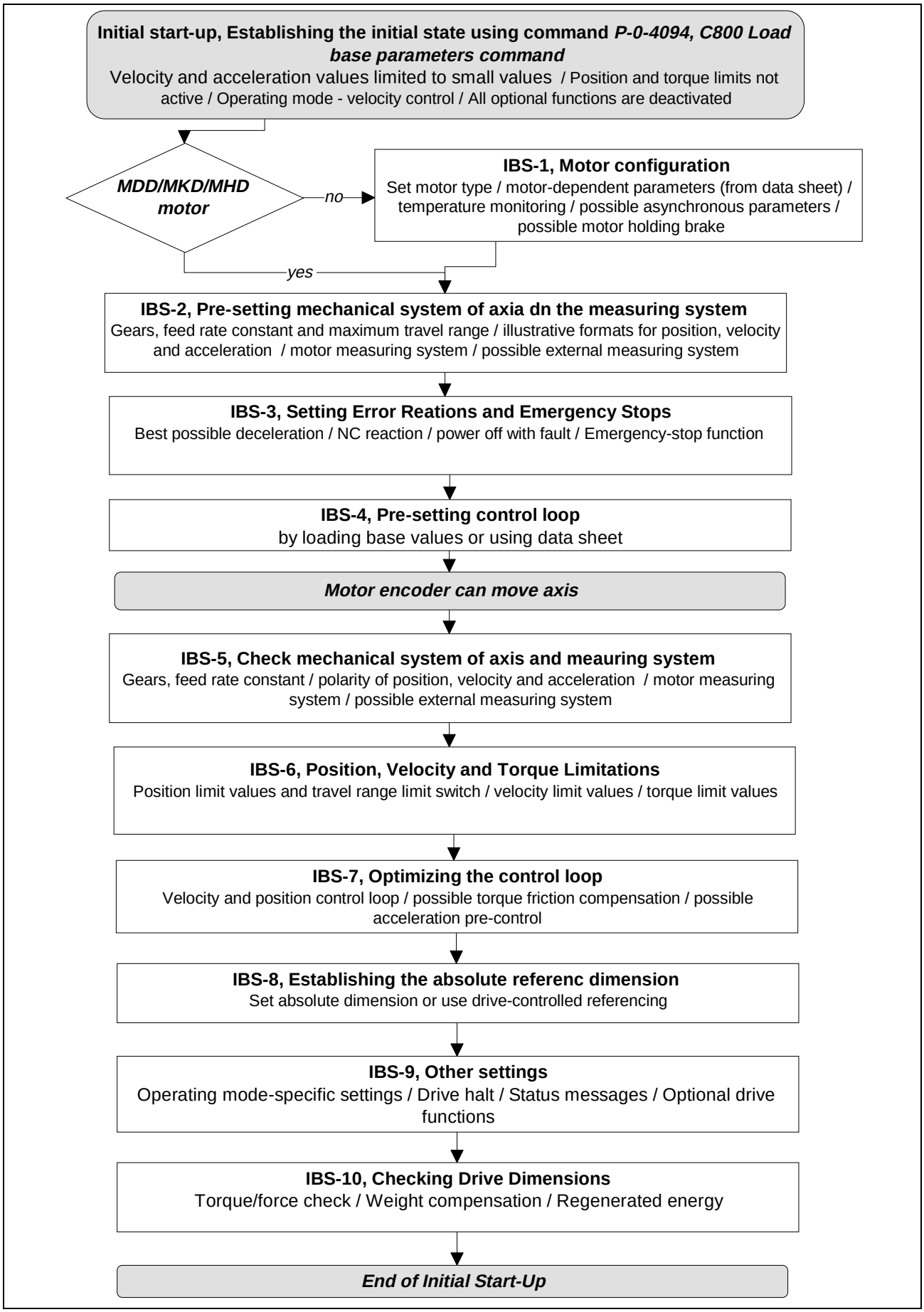

Initial start-up, Establishing the initial state using command P-0-4094, C800 Load base parameters command
Velocity and acceleration values limited to small values / Position and torque limits not active / Operating mode - velocity control / All optional functions are deactivated
MDD/MKD/MHD motor
no
IBS-1, Motor configuration
Set motor type / motor-dependent parameters (from data sheet) / temperature monitoring / possible asynchronous parameters / possible motor holding brake
yes
IBS-2, Pre-setting mechanical system of axia dn the measuring system
Gears, feed rate constant and maximum travel range / illustrative formats for position, velocity and acceleration / motor measuring system / possible external measuring system
IBS-3, Setting Error Reations and Emergency Stops
Best possible deceleration / NC reaction / power off with fault / Emergency-stop function
IBS-4, Pre-setting control loop
by loading base values or using data sheet
Motor encoder can move axis
IBS-5, Check mechanical system of axis and meauring system
Gears, feed rate constant / polarity of position, velocity and acceleration / motor measuring system / possible external measuring system
IBS-6, Position, Velocity and Torque Limitations
Position limit values and travel range limit switch / velocity limit values / torque limit values
IBS-7, Optimizing the control loop
Velocity and position control loop / possible torque friction compensation / possible acceleration pre-control
IBS-8, Establishing the absolute referenc dimension
Set absolute dimension or use drive-controlled referencing
IBS-9, Other settings
Operating mode-specific settings / Drive halt / Status messages / Optional drive functions
IBS-10, Checking Drive Dimensions
Torque/force check / Weight compensation / Regenerated energy
End of Initial Start-Up

Fig. 3-7:Commissioning guidelines

IBS-1, Motor configuration

These guidelines are needed in the case where the motor used does not have a motor feedback memory. It is necessary with these motors

- to enter the parameters which specify the motor features, e.g., peak current, maximum velocity and so on. The data sheet can be used for this purpose.
- The parameters for the motor temperature warning and off thresholds must be parametrized as well
- and giving a motor holding brake, these must be properly set also.

Those motors with data memory such as

- MDD and
- MKD motors

are recognized by the drive and motor parameters are automatically set.

(See also: "Setting the motor type“.)

IBS-2, Pre-setting the axis mechanics and measuring systems

These guidelines set the parameters for detecting and processing position information. These include the following parameters for the following settings:

- mechanical gear ratio between motor and load as well as any existing feedrate constants of the drive of linear slides
- scaling settings for showing position, velocity and acceleration parameters of the drive. This sets, for example, whether the data is motor shaft or load related and which LSB valence these have, e.g., position data with 0.001 degrees or 0.0001 inches and so on.
- Interface, direction of movement and resolution of an external encoder.

(See also: -"Physical Values Display Format"
-"Mechanical Transmission Elements" and
-"Setting the Measurement System").

IBS-3, Setting the error reactions and E-stop

In this step, the reaction of the drive in the event of an error is set as well as the triggering of the drive's own E-stop input. The following parametrizations must be performed:

- type and mode of error reactions in drive
- selection whether NC reaction in error case should happen
- selection whether and when the power supply is switched off and whether a package reaction is to be conducted
- Configuration of the E-stop input

(See also: "Drive Error Reaction“)

IBS-4, Pre-setting Control Loop

The parameters for current, velocity and position control loops are set to their base values in this step. This is done either by executing command **S-0-0262, C700 Command Basic Load** (in MDD and MKD motors) or by manually inputting them using the data sheet.

Setting the control loop in this way makes ensures a good level of quality for most applications. Should additional optimization of the contrtol loop parameters become necessary (velocity and position control loop parameters, compensation functions and precontrol), then use commissioning step no. 7.

(See also "Control loop settings".)

IBS-5, Checking axis mechanics and measuring system

The presettings made in IBS 2 are checked here and modified, if necessary. This means that the axis must be moved by jogging. The following checks must be made:

- check the rotational direction of the motor encoder. With non-inverted position polaritiy (**S-0-0055, Position Polarity Parameter** = 0), the values in parameter **S-0-0051, Position Feedback Value 1 (Motor Feedback)** should have a rising order with a clockwise rotation of the motor. (This check need not be performed in MDD and MKD motors. If this is not the case, then bit 2 in **S-0-0277, Position feedback 1 type parameter** must be inverted.
- By moving the axes and examining the position feedback value of the motor encoder in parameter **S-0-0051, Position Feedback Value 1 (Motor Feedback)** it can be controlled whether a distance in this process is correctly displayed. If not, then the settings for mechanical gear ratio, feedrate constants and encoder resolution must be checked.
- Given an external encoder, by moving the axis and examining the position feedback value of the external encoder in parameter **S-0-0053, Position Feedback Value 2 (Ext. Feedback)** it can be checked whether a distance is correctly displayed with this process. **S-0-0051, Position Feedback Value 1 (Motor Feedback)** and **S-0-0053, Position Feedback Value 2 (Ext. Feedback)** should run parallel when jogging a specific path. If not, then check the settings in **P-0-0075, Interface Feedback 2, external, S-0-0117, Resolution of external feedback, S-0-0115, Position feedback 2 type parameter** and **P-0-0185, Function of ext. Encoder.**

(See also: -"Physical Values Display Format"
-"Mechanical Transmission Elements" and
-"Setting the Measurement System").

IBS-6, Limits for position, velocity and torque

The limits for the travel range are conducted by setting

- position limits values and/or
- travel range limit switches

as well as the limit values for the axis velocity and maximum drive torque/force are parametrized also.

(See also: -"Torque/force limiting",
-"Travel range limits" and
-"Limiting velocity".)

IBS-7, Optimizing the control loop

This step is only necessary if the settings for velocity and position control loops in IBS 4 did not achieve the needed quality. As such, optimize the control behavior as follows:

- modify the parameter for velocity and position control loops
- possibly activate the acceleration pre-control
- possibly activate the friction torque compensation
- possibly activate the velocity mixture and
- possibly activate the notch filter.

(See also: "Drive Error Reaction“.)

IBS-8, Establishing absolute reference measuring

- Here the absolute reference measuring is set in terms of the machine zero point of the position feedback value from motor encoder and possibly external encoder. The position feedback values at first show any, not machine zero point related values. By conducting
- setting absolute measuring (with absolute encoders) or
- drive-controlled homing

the coordinate systems of the position encoder and the coordinate system of the machine are made congruent.

(See also: -"Drive-controlled homing" and
-"Set Absolute Measuring")

IBS-9, Other settings

Here

- operating mode specific settings,
- drive halt function is parametrized,
- the language selected,
- general status message settings and
- the optional drive function settings are conducted.

(See also: -"Drive stop“,
-"S-0-0013, Class 3 Diagnostics“,
-"S-0-0182, Manufacturer Class 3 Diagnostics“,
-"Extended Drive Functions“ and
-"Language selection".)

IBS-10,Controlling drive dimensions

The power-related drive checks are conducted here. It is checked whether the continuous and peak power of drive amplifier and motor meet the requirements. The following checks are conducted for this purpose:

- generated torque/force of motor is checked. At a constant speed 60% and in rapid traverse 75% of the continuous torque at standstill of the motor should not be exceeded
- during the acceleration phase 80% of the maximum torque of the motor/controller combination may not be exceeded
- the thermal load of the drive amplifier should equal a maximum of 80%

(See also: "Monitoring the Thermal Load".)

With vertical axis, the weight compensation must be set so that the current consumption with upwards and downwards motions of the axes have the same minimum value.

Check the regenerated peak power and regenerated continuous power.

3.3 Diagnostic Configurations

Overview of Diagnostic Configurations

The diagnostics are configured into 2 groups:

- Current operating status and diagnostics
- Class diagnostics

Parameters exist for all important operating data.

Drive-Internal Diagnostics

The current operating condition of the drive is evident by which errors, warnings, commands, drive stop signals and drive interlock signals are available and which operating mode is active. Whether the drive is in preparation for operation or in parameter mode also is displayed.

The current operating condition can be determined from

- the 2-part seven-segment display (H1 display)
- the diagnostic parameter **S-0-0095, Diagnostic Message**
- the parameter **S-0-0390, Diagnostic Message Number**
- the parameter **P-0-0009, Error Message Number**

The current diagnostic message with the highest priority is always shown in the H1 display, in the diagnostic parameter **S-0-0095, Diagnostic Message** and in the parameter **S-0-0390, Diagnostic Message Number**. The parameter **P-0-0009, Error Message Number** will contain a value unequal to 0 if an error is present. An overview of all diagnostic messages can be found in the diagnostic description in Supplement B.

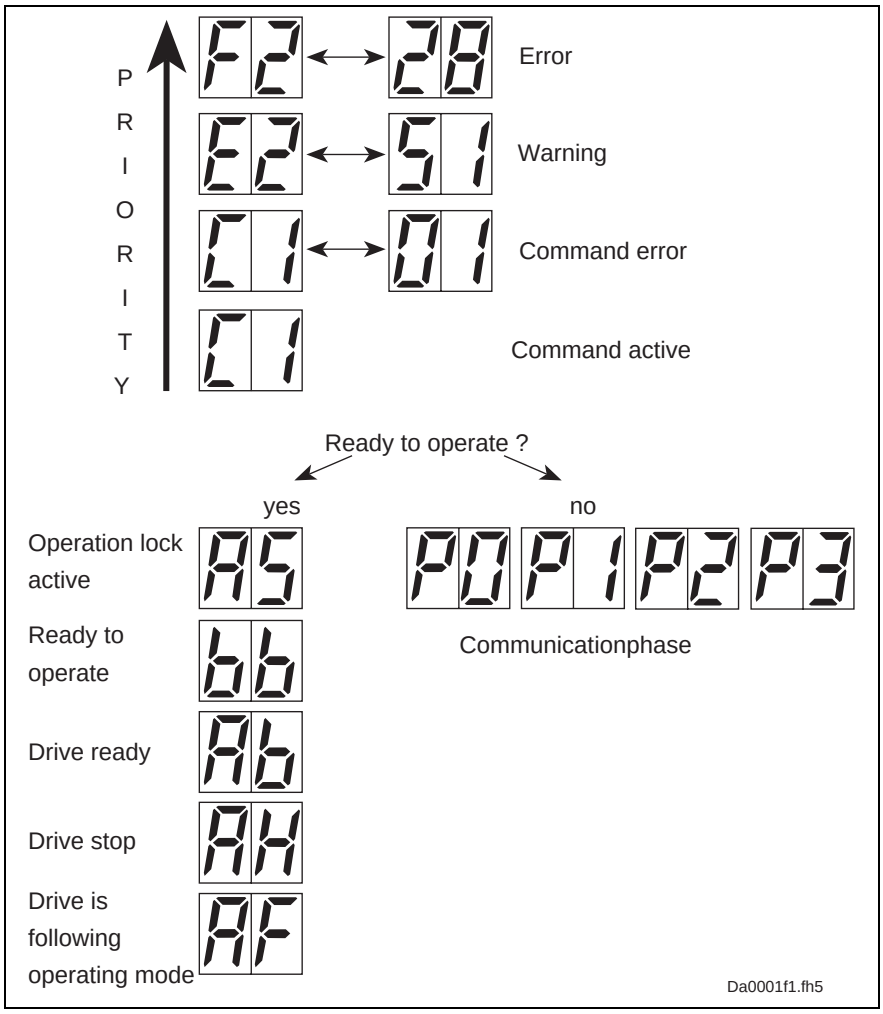


Fig. 3-8: Priority-dependent diagnostic formation in the H1 display

Diagnostic Message Composition

Each operating condition is designated with a diagnostic message, which consists of a

- diagnostic message number and a
- diagnostic text

For example, the diagnostic message for the non-fatal error "Excessive Control Deviation" is displayed as follows.

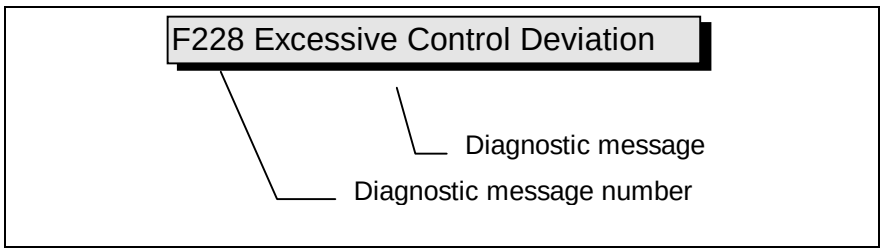


Fig. 3-9: Diagnostic message composition with a diagnostic message number and text

The H1 display alternates "F2" and "28". The diagnostic message number appears in hexadecimal format in the parameter **S-0-0390, Diagnostic Message Number**. In this example, this would be (0x)F228. The diagnostic message number and the diagnostic text are contained as a string "**F228 Excessive deviation**" in the parameter **S-0-0095, Diagnostic Message**.

H1-Display

The diagnostic number appears on the two-part seven-segment display. The form of the display emerges from the graphic "Priority-Dependent Display of the Diagnostic Message".

With the help of this display, it is possible to quickly determine the current operating status without using a communication interface.

The operating mode cannot be seen on the H1-Display. If the drive follows the operating mode and no command was activated, then the symbol "AF" appears on the display.

Diagnostic Message

The diagnostic message contains the diagnostic number followed by the diagnostic text, as shown in the example, "Excessive Control Deviation." It can be read with the parameter **S-0-0095, Diagnostic Message** and directly displays the operation status on an operator interface.

The diagnostic message language can be changed.

Diagnostic Message Number

The diagnostic message number contains only the diagnostic number without the text. It can be read with the parameter **S-0-0390, Diagnostic Message Number** .

Error Number

The error number contains only the error number without the diagnostic text. It can be read with the parameter **P-0-0009, Error Message Number** and can indicate an error condition without a language barrier. This parameter contains a value unequal to "0" if an error is present in the drive.

An error is formed from the bottom 3 digits of the diagnostic number. For example, the error "**F228 Excessive deviation**" with the diagnostic message number "(0x)F228" would produce the error number "228."

Collection of Status

The class diagnostics parameters provide a collection of status and diagnostic information for displaying operating conditions. These parameters are:

- **S-0-0011, Class 1 Diagnostics**
- **S-0-0012, Class 2 Diagnostics**
- **S-0-0013, Class 3 Diagnostics**
- **S-0-0182, Manufacturer Class 3 Diagnostics**

S-0-0011, Class 1 Diagnostics

Bits for the various errors are contained in parameter **S-0-0011, Class 1 Diagnostics**. A bit is set in this parameter in the case of a drive error. The bit "Drive Interlock, Error in Class 1 Diagnostics" is set simultaneously in the **drive status word**.

All bits in Class 1 Diagnostics can be cleared by executing the command **S-0-0099, C500 Reset class 1 diagnostic**.

(see Clearing Errors)

The following bits are supported in Class 1 Diagnostics.

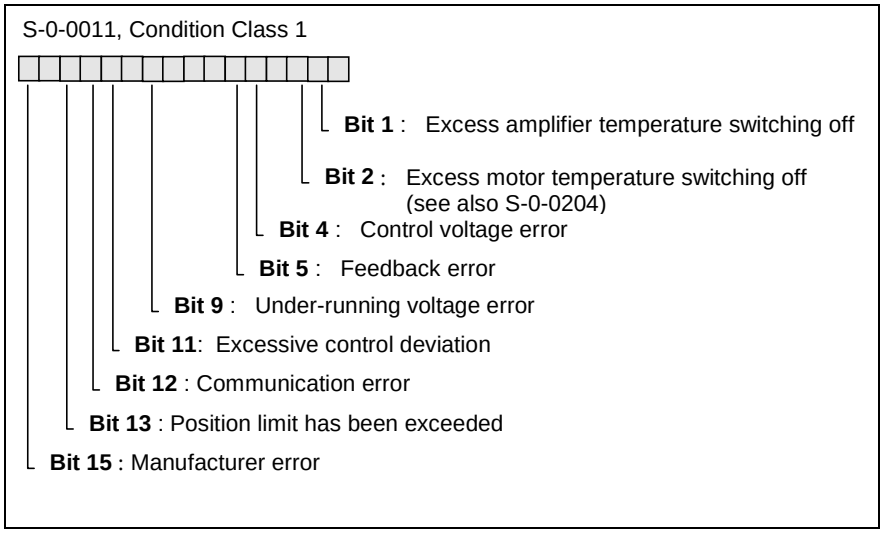

S-0-0011, Condition Class 1
Bit 1 : Excess amplifier temperature switching off
Bit 2 : Excess motor temperature switching off
(see also S-0-0204)
Bit 4 : Control voltage error
Bit 5 : Feedback error
Bit 9 : Under-running voltage error
Bit 11: Excessive control deviation
Bit 12 : Communication error
Bit 13 : Position limit has been exceeded
Bit 15 : Manufacturer error

Fig. 3-10: S-0-0011, Class 1 Diagnostics

Toggling a bit is signaled by a change bit in the drive status word.

S-0-0012, Class 2 Diagnostics

Bits for various warnings are contained in this parameter. A bit is set in this parameter when a warning occurs. The bit "Change Bit Class 2 Diagnostics" is set simultaneously in the **drive status word**. This change bit is cleared by reading **S-0-0012, Class 2 Diagnostics** . Warnings may be masked in regards to their effect on the change bit with the parameter **S-0-0097, Mask class 2 diagnostic** .

The following bits are supported in class 2 diagnostics.

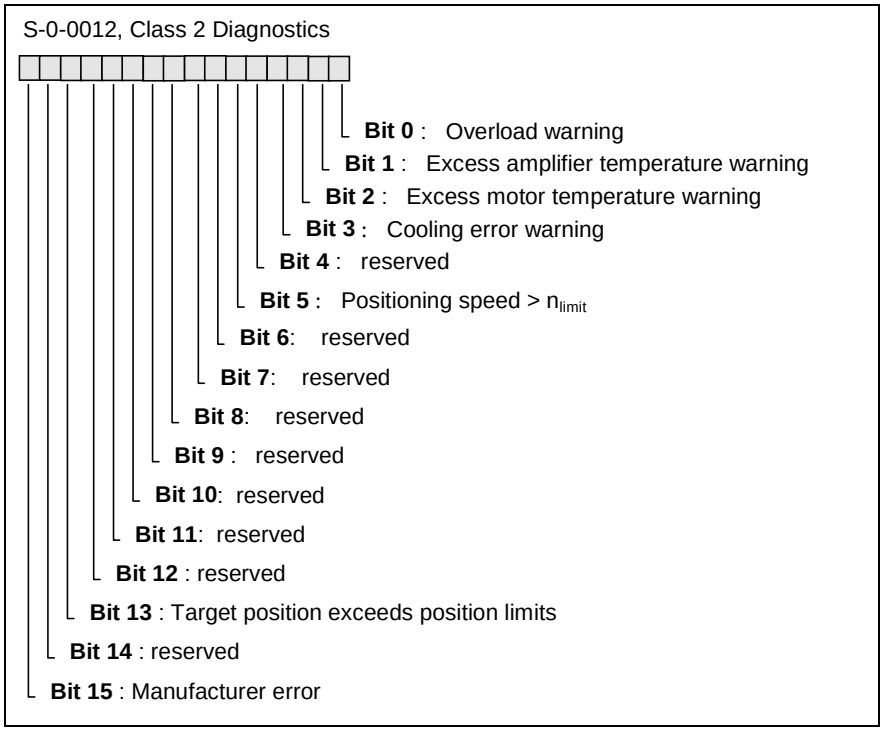

S-0-0012, Class 2 Diagnostics
Bit 0 : Overload warning
Bit 1 : Excess amplifier temperature warning
Bit 2 : Excess motor temperature warning
Bit 3 : Cooling error warning
Bit 4 : reserved
Bit 5 : Positioning speed > n limit
Bit 6: reserved
Bit 7: reserved
Bit 8: reserved
Bit 9 : reserved
Bit 10: reserved
Bit 11: reserved
Bit 12 : reserved
Bit 13 : Target position exceeds position limits
Bit 14 : reserved
Bit 15 : Manufacturer error

Fig. 3-11: Composition of the parameter S-0-0012, Class 2 Diagnostics

S-0-0013, Class 3 Diagnostics

Various operating status messages are stored here. If the status of a message changes, a bit will also be set here in the **Drive Status Word ("**Change Bit Class 3 Diagnostics"). This change bit is cleared by reading **S-0-0013, Class 3 Diagnostics** . Warnings may be masked in regards to their effect on the change bit with the parameter **S-0-0098, Mask class 3 diagnostic**.

The following bits are supported in Class 3 Diagnostics.

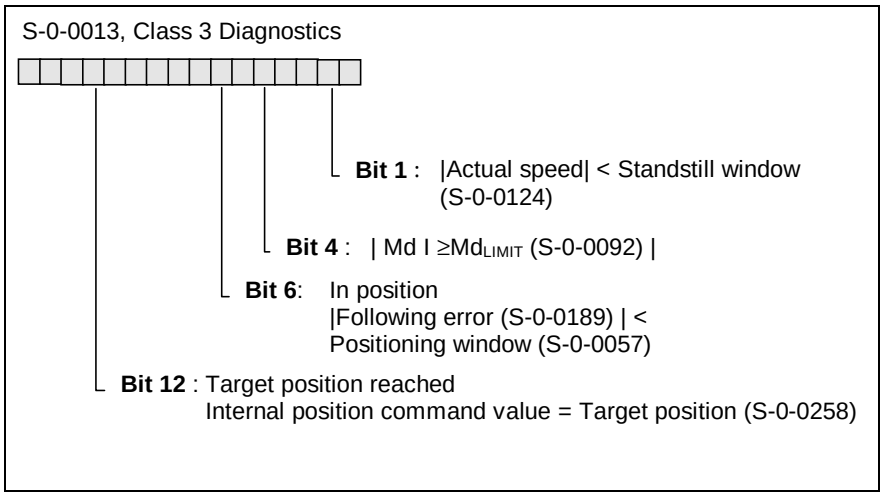

S-0-0013, Class 3 Diagnostics
Bit 1 : |Actual speed| < Standstill window (S-0-0124)
Bit 4 : | Md I ≥Md$_{LIMIT}$ (S-0-0092) |
Bit 6: In position |Following error (S-0-0189) | < Positioning window (S-0-0057)
Bit 12 : Target position reached Internal position command value = Target position (S-0-0258)

Fig. 3-12: Composition of S-0-0013, Class 3 Diagnostics

Class 2 and 3 Diagnostic Change Bits in the Drive Status Word

If the condition of a bit in **S-0-0012, Class 2 Diagnostics** or **S-0-0013, Class 3 Diagnostics** changes, the change bit class 2 or 3 diagnostics is set in the drive status word. This change bit is cleared by reading both parameters. Setting the change bit with bit-toggling in S-0-0012 or

S-0-0013 can be masked with the help of the parameter **S-0-0097, Mask class 2 diagnostic** or **S-0-0098, Mask class 3 diagnostic** .

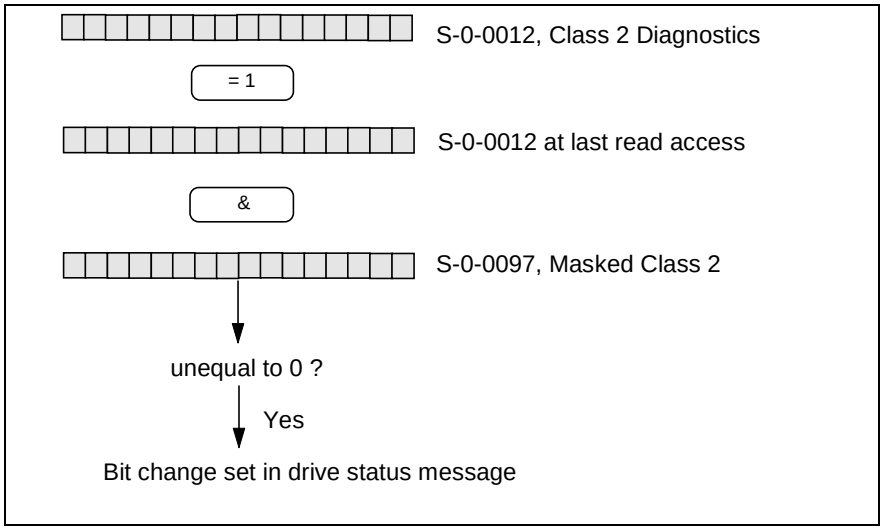


Fig. 3-13: Composition of the class 2 diagnostics change bit

S-0-0182, Manufacturer Class 3 Diagnostics

The parameter **S-0-0182, Manufacturer Class 3 Diagnostics** contains the current operating status. If the status changes, this is not signaled with a change bit.

The following bits are supported in the Manufacturer Class 3 Diagnostics.

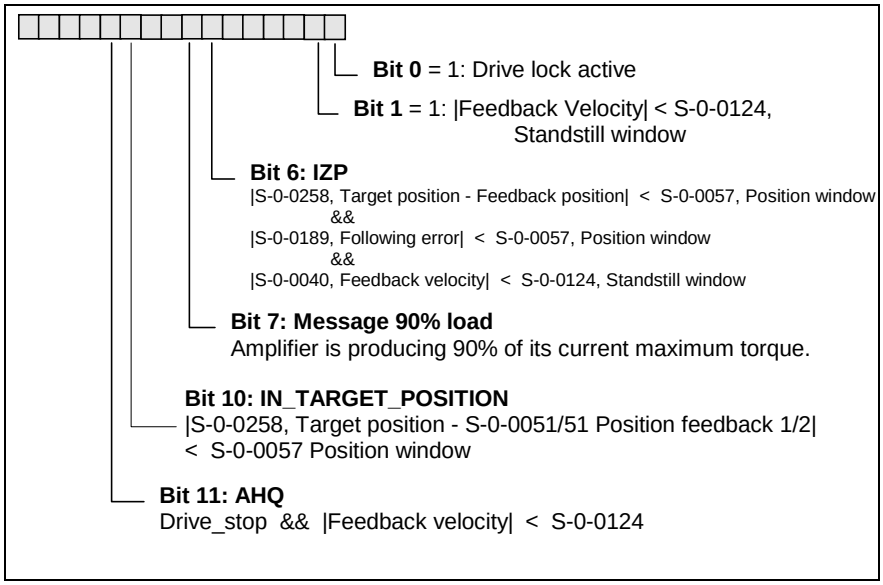

Bit 0 = 1: Drive lock active
Bit 1 = 1: |Feedback Velocity| < S-0-0124, Standstill window
Bit 6: IZP
|S-0-0258, Target position - Feedback position| < S-0-0057, Position window
&&
|S-0-0189, Following error| < S-0-0057, Position window
&&
|S-0-0040, Feedback velocity| < S-0-0124, Standstill window
Bit 7: Message 90% load
Amplifier is producing 90% of its current maximum torque.
Bit 10: IN_TARGET_POSITION
|S-0-0258, Target position - S-0-0051/51 Position feedback 1/2| < S-0-0057 Position window
Bit 11: AHQ
Drive_stop && |Feedback velocity| < S-0-0124

Fig. 3-14: Composition of S-0-0182, Manufacturer Class 3 Diagnostics

Configurable signal status word

The configurable signal status word supports recording of a maximum of 16 copies of bits from other drive parameters. This means that the user can put a bit list together that contains all drive status information needed for the control.

The bits in the signal status are put together every SERCOS cycle in **S-0-0007, Feedback Acquisition Starting Time (T4).**

The parameters

- **S-0-0144, Signal status word**
- **S-0-0026, Configuration list signal status word**
- **S-0-0328, Config. list for signal status word, bit number**

are used for this purpose.

The configuration of the signal status word uses parameter **S-0-0026, Configuration list signal status word** and **S-0-0328, Config. list for signal status word, bit number.** These parameters are of variable lengths with two byte data elements.

In parameter **S-0-0026, Configuration list signal status word** the ID numbers of the parameters which contain the orignal bits (sources) are specified. The position of an ID number in the list fixes the bit in the signal status word this ID number applies to. For example, the first list element sets the source of bit 0 of the signal status word.

Which bit is copied out of the parameters selected with **S-0-0026, Configuration list signal status word** and copied into the signal status word, is set in **S-0-0328, Config. list for signal status word, bit number.** Should this list remain empty, then bit 0 of the set parameter is automatically copied. Otherwise, that bit is set here that was taken out of

the source parameter. Bit numbers of 0 (LSB) up to 31 (MSB) can be entered. For each bit number of this list there must be at the same list position an ID number in the list S-0-0026. Otherwise, when writing the bit number list the drive will generate the error message "ID number not available". This is why list **S-0-0026, Configuration list signal status word** must be written prior to **S-0-0328, Config. list for signal status word, bit number.**

Example: A signal status word with the following configuration is to be put together:

Bit no. in S-0-0144, signal status word	ID number of the orignal parameter	Bit no. of the original parameter	Definition
0	S-0-0013	1	Vactual = 0
1	S-0-0182	6	IZP
2	S-0-0403	0	position status
3	P-0-0053	19	bit toggles every half master axis encoder revolution
4	S-0-0410	0	Probe 1 negative latched
5	P-0-0016	4	P-0-0015 sets the memory address of a drive internal counter. Bit 4 is transmitted from there.

Fig. 3-15 Example of a configurated signal status word

Parameters **S-0-0026, Configuration list signal status word** and **S-0-0328, Config. list for signal status word, bit number** must be configured as follows:

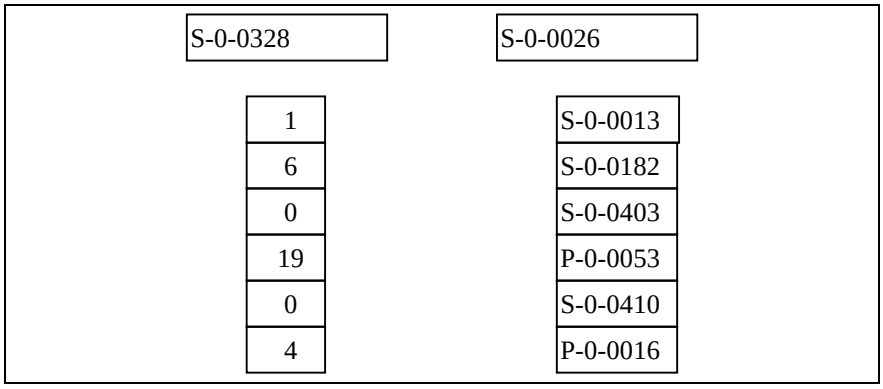


fig. 3-16: Configuration example of parameters S-0-0328 and S-0-0026

Note: Up to 16 bits can be configured. Configuration must be from the least significant in the direction of the most significant bit. In other word, the positon of the bit copy in the signal status word results from the continuous configuration in S-0-0026.

Checking the input of S-0-0026, configuration list signal status word and S-0-0328, configuration list signal status word bit number

When inputting one of the two parameters, the following checks are run:

- If in **S-0-0328, Config. list for signal status word, bit number** more elements are programmed than in **S-0-0026, Configuration list signal status word,** then error message "*0x1001, ID number not avaialble"* is generated.
- If an ID number specified in **S-0-0026, Configuration list signal status word** is not available, then error message "*0x1001, ID number not avaialble"* is generated.
- Check wehther the IDN variable data length set in **S-0-0026, Configuration list signal status word** (list parameters) or a socalled online reader function is there. Parameters with online reader functions are generally parameters with physical units (position, velocity, acceleration and currents) as well as parameter **S-0-0135, Drive status word** and **S-0-0011, Class 1 Diagnostics.** If yes, then the service channel error message *0x7008, data not correct* is generated.

Note: In all these cases only those entries up to the faulty element are accepted!

3.4 Parameter Mode - Operation Mode

The SERCOS control sets the communication phases including parameter mode.

After the drive is turned on, it does not automatically switch to the operating mode. The drive is put through a series of checks before the SERCOS control can switch the drive into operation mode.

Switching the drive to the operating mode is dependent on making the SERCOS INTERFACE system ready to operate.

This must occur in steps and is controlled by the master control by entering the communication phase 0 through 4 and starting/ending the commands **S-0-0127, C100 Communication phase 3 transition check** and **S-0-0128, C200 Communication phase 4 transition check**.

If the drive reaches phase 4 without errors, "**bb**" will appear on the H1 display. The diagnostic message is: **A013 Ready for power on**

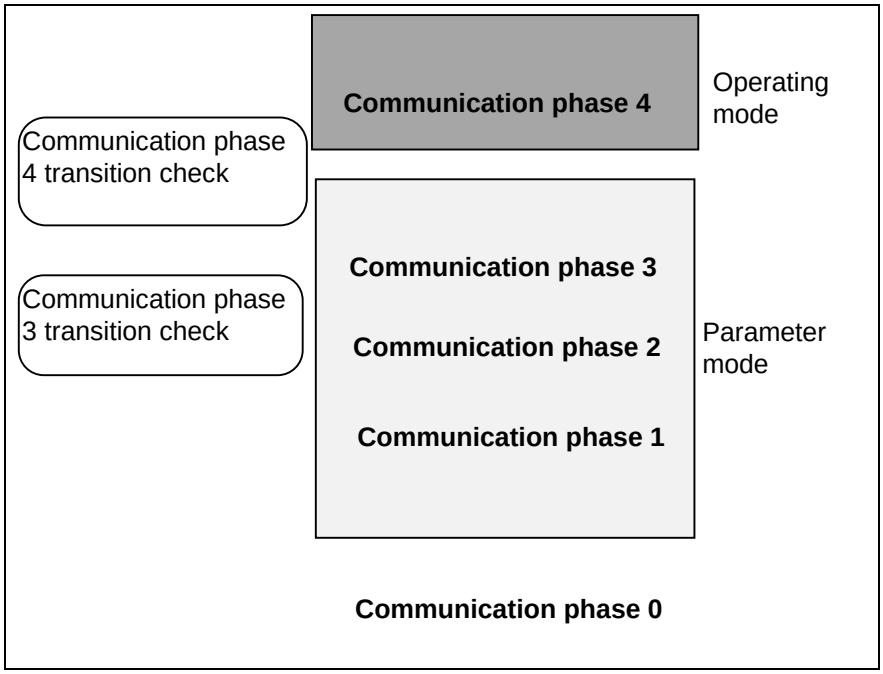


Fig. 3-17: Communication Phases

Communication between the SERCOS control and the drive is not possible during phase 0. Parameterization mode is given during communication phases 1..3.

Monitoring in the Transition Check Command

Transition check commands must be activated in the drive in order to switch from communication phase 2 to 3 and from 3 to 4. This commences a series of checks and parameter calculations.

S-0-0127, C1 Communication Phase 3 Transition Check

The descriptions and solutions for transition check errors can be found in Supplement B, Diagnostic Message Descriptions.

The following checks are run when this command is activated.

The telegram configuration is checked. The SERCOS cyclic telegram is checked for valid parameters configured in the MDT or AT data blocks and to ensure that the maximum length is not exceeded.

The command errors:
C104 Config. IDN for MDT not configurable
C105 Configurated length > max. length for MDT
C106 Config. IDN for AT not configurable
C107 Configurated length > max. length for AT
may occur.

Parameters are checked for proper values before the drive can switch into phase 3. If a parameter has an improper value, the following command error will occur:
C101 Invalid communication parameter (S-0-0021)
The SERCOS ID numbers of invalid parameters are listed in **S-0-0021, IDN List of Invalid Op. Data for Comm. Ph.2** and must be corrected before allowing a transition to phase 3.

The timing parameter for SERCOS communication in phase 3 and 4 are checked for proper values.

The command errors:
C108 Time slot parameter > Sercos cycle time
C109 Position of data record in MDT (S-0-0009) even
C110 Length of MDT (S-0-0010) odd
C111 ID9 + Record length - 1 > length MDT (S-0-0010)
C112 TNcyc (S-0-0001) or TScyc (S-0-0002) error
C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) error
C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
C115 T2 too small may occur.

S-0-0128, C2 Communication Phase 4 Transition Check

The following checks are run when this command is activated.

- Parameter **P-0-4014, Motor Type** is checked for a proper value. The command error **C204 Motor type P-0-4014 incorrect** occurs if 1 (MDD) or 5 (MKD/MKE) is entered in this parameter but the corresponding motor type is not found in the motor feedback data memory.
- The parameters are checked for proper values required for switching in phase 4. The command error **C201 Invalid parameter(s) (->S-0-0022)** occurs if one or more of the required parameters are invalid. The SERCOS ID numbers of the invalid parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph.3** and must be corrected.
- The drive-controller reads the operating data out of the EEPROM of the drive controller. If an error occurs during this process, then the command error **C212 Invalid amplifier data (->S-0-0022)** appears.

The ID numbers of the faulty parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph.3**.

- A check is done to see if an external encoder is needed according to the operating mode parameters *S-0-0032..35* or homing parameter *S-0-0147*, but is not available because a 0 is entered in the parameter **P-0-0075, Interface Feedback 2, external**. The invalid parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph.3**. The command error **C210 External feedback required (->S-0-0022)** is issued.
- Check whether a motor encoder is available (**P-0-0074, Interface Feedback 1** = 0) and in function parameters **P-0-0185, Function of ext. Encoder** no "2" has been entered for the loadside motor encoder. If this is the case, then command error **C236 Motor feedback required (P-0-0074)** is generated**.**
- Checking motor encoder settings: If the encoder interface parametrized in **P-0-0074, Interface Feedback 1** is not available, then error message **C232 Motor encoder interface not present** is generated. If a motor encoder with feedback memory is used, but its data cannot be read, then error message **C217 Motor feedback data reading error** is generated.
- Checking the settings for the external encoder. If the encoder interface parametrized in **P-0-0075, Interface Feedback 2, external** is not available, then error message **C233 External encoder interface not present** is generated. If the encoder interface set in **P-0-0075, Interface Feedback 2, external** is already occupied by the motor encoder, then error message **C234 Encoder combination not possible** is generated. If an external encoder with feedback memory is used, but its data cannot be read, then error message **C218 External feedback data reading error** is generated. If in parameter **P-0-0185, Function of ext. Encoder** "loadside motor encoder" is selected, but no rotary asynchronous motor is available, then error message **C235 Load-side motor encoder with inductance motor only** is generated.
- The parameters stored in memory are read from motors with feedback data storage. If an error is found, the command error **C211 Invalid feedback data (->S-0-0022)** appears.
- Check whether an internal position resolution has been set via **S-0-0278, Maximum travel range,** which guarantees a correct commutation of the motor. If not, then command error **C223 Input value for max. range too high** is generated.
- The scaling format is checked for position, acceleration, velocity and torque for proper configuration. If an error is found, one of the following errors
  C213 Position data scaling error
  C214 Velocity data scaling error
  C215 Acceleration data scaling error
  C216 Torque/force data scaling error
  is issued.
- Values are checked for each parameter. The minimum and maximum values of each of the parameters are checked, and parameters with bit format are checked for proper configuration. If an error is found, the command error
  C202 Parameter limit error (->S-0-0022)
  is issued. The SERCOS ID numbers of the invalid parameters are listed in
  S-0-0022, IDN List of Invalid Op. Data for Comm. Ph.3 and should be corrected.

- The parameter S-0-0103 Modulo Value is checked for its ability to be processed when modulo scaling is activated. If the parameter cannot be processed, the command error **C227 Modulo range error** is generated.
- Determines if the coprocessor is ready for initialization. If it is not, the error message **C225 Coprocessor not ready for initialization** will appear.
- Special checks executed for specific parameters. For example, the encoder interface parameters P-0-0074/75 are checked to see if the selected encoder interface is actually available. If discrepancies are found, the command error **C203 Parameter calculation error (->S-0-0022)** is issued. The ID numbers of the invalid parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph.3** and should be corrected.
- Encoder initializations are executed. Depending on the type of encoder, specific errors may occur during initialization (for example, invalid position with DSF feedback). One of the following command errors
  C220 Motor feedback initializing error
  C221 Ext. feedback initializing error
  will be issued.
- Query whether coprocessor has processed initialization value and accepted it. If not, then command error **C226 Coprocessor acknowledge failed** is generated.
- Depending on controller type, various internal settings are performed. If parameter S-0-0140, controller type cannot be read, then command error **C228 Controller type S-0-0140 wrong** is generated.
- Absolute encoder monitoring. If the actual position is outside the actual position range +/- **P-0-0097, Absolute encoder monitoring window** before the machine was last switched off, the error **F276 Absolute encoder out of allowed window** will be generated. The transition command will not be acknowledged as an error, but the error may be cleared by executing the command **S-0-0099, C500 Reset class 1 diagnostic, error reset**.

  (See also "Clearing error".)

Notes

4 Communication Through the SERCOS-interface

4.1 Overview of SERCOS Communication

Communication of devices with DIAX software can be done only through the SERCOS interface at this time. The basic features of this interface are:

- **Data exchange cycle of set and actual values with exact time equidistance**
- **Synchronization of measurement point and command value input**
- **Overall synchronization of all drives connected to the control**
- **Minimum cycle time 0.5 ms / maximum cycle time 65 ms**
- **Baud rate selectable, either 2 or 4 MBaud**
- **Service channel for settings and diagnostics**
- **Data transfer through fiber optic ring**
- **Configuration of the telegram contents**
- **SERCOS compatibility class B, granularity 2, i.e., a multiple of 500 µs as cycle time can be set.**

The features of the interface are mentioned here briefly. More detailed information is included in the SERCOS interface specification.

4.2 Data Transfer Cycle through SERCOS

To synchronize the drives in a ring, the **Master Synchronization Telegram** (MST) is sent at the beginning of every SERCOS cycle. The MST contains only the preset communication phase information from the master.

You can configure the master data and drive telegram.

Once during every Sercos cycle, a **Master Data Telegram** (MDT) is sent from the control to every drive. The master control word, the service channel and a configurable data block are included here. In this data block, the command and limit values are contained, which are sent by the control according to the operation mode of the drive. The contents of this data block can be configured through the telegram settings.

The master data telegram is received by all drives in the ring at the same time.

In addition, a **Drive Telegram** (AT) is sent during each Sercos cycle time from every drive to the control. The drive status word, the service channel and a configurable data block are contained here. This data block contains mainly actual and status values, which are needed to operate the corresponding drives by the control.

Master Control Word

The master control word is part of the Master Data Telegram. The most important control information for the drives is contained here, such as

- **Drive ON and Drive enable**
- **Drive Stop**
- **Interpolator cycle**
- **Set operation mode**
- **Real-time control bit 1 and 2**
- **Control information for the service channel**

The master control word is structured as follows:

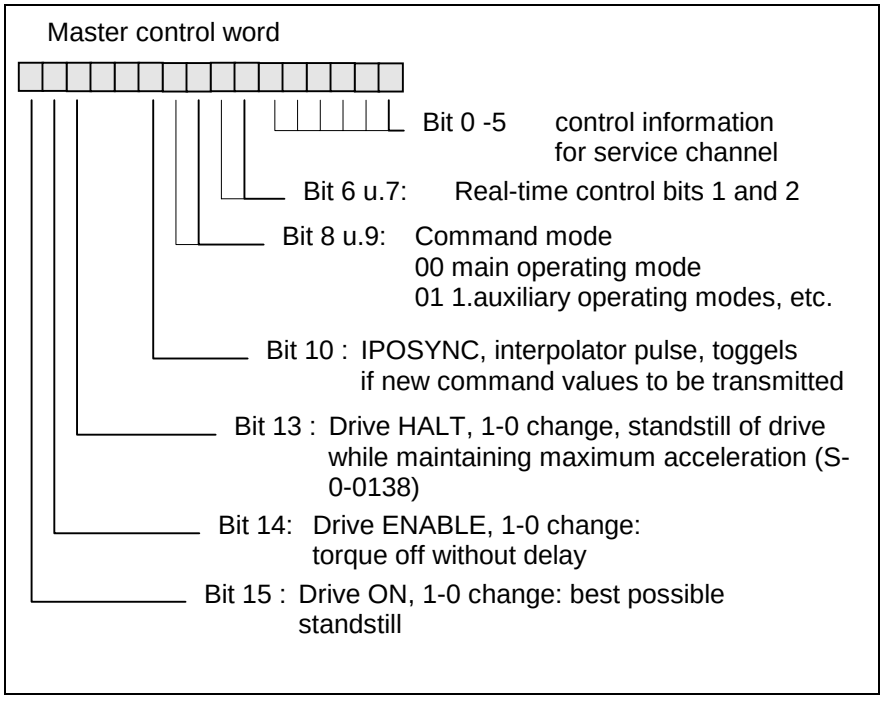

Master control word
Bit 0 -5 control information for service channel
Bit 6 u.7: Real-time control bits 1 and 2
Bit 8 u.9: Command mode
00 main operating mode
01 1.auxiliary operating modes, etc.
Bit 10 : IPOSYNC, interpolator pulse, toggels if new command values to be transmitted
Bit 13 : Drive HALT, 1-0 change, standstill of drive while maintaining maximum acceleration (S-0-0138)
Bit 14: Drive ENABLE, 1-0 change: torque off without delay
Bit 15 : Drive ON, 1-0 change: best possible standstill

Fig. 4-1: Structure of the master control word

The master control word is transferred through the service channel to the control by using the parameter **S-0-0134, Master control word**.

Drive enable

The activation of the drive is done through a 0-1 edge of the drive enable signal. For drive controllers with a SERCOS Interface, the drive enable signal corresponds to bit 15 in the master control word of the master data telegram.

To have the drive enable signal accepted (meaning that the drive is ready to accept commands from the control), the following requirements must be fulfilled:

- SERCOS Interface in operating mode (Communication phase 4)
- No drive error
- Power section enabled

In this condition, the drive displays "**Ab**" on the seven-segment display, and the drive diagnostic from the parameter **S-0-0095, Diagnostic Message** is **A012 Control and power sections ready for operation**.

If the drive enable is set, the seven-segment display changes to "**AF**". After that it displays the drive diagnostic for the activated operation mode (i.e., **A101 Drive in VELOCITY control**).

If the drive enable is activated without a DC bus voltage ("**Ab**" doesn't appear on the H1 display), the error message **F226 Undervoltage in power section** will be displayed.

Drive Status Word

The drive status word is part of the drive telegram. All important status information for the drive is contained here.

- **Readiness for use of the control and power sections**
- **Drive error**
- **Change bits for diagnostics class 2 and 3**
- **Current operation mode**
- **Real-time status bits 1 and 2**
- **Status information for the service channel**

The drive status word is structured as follows:

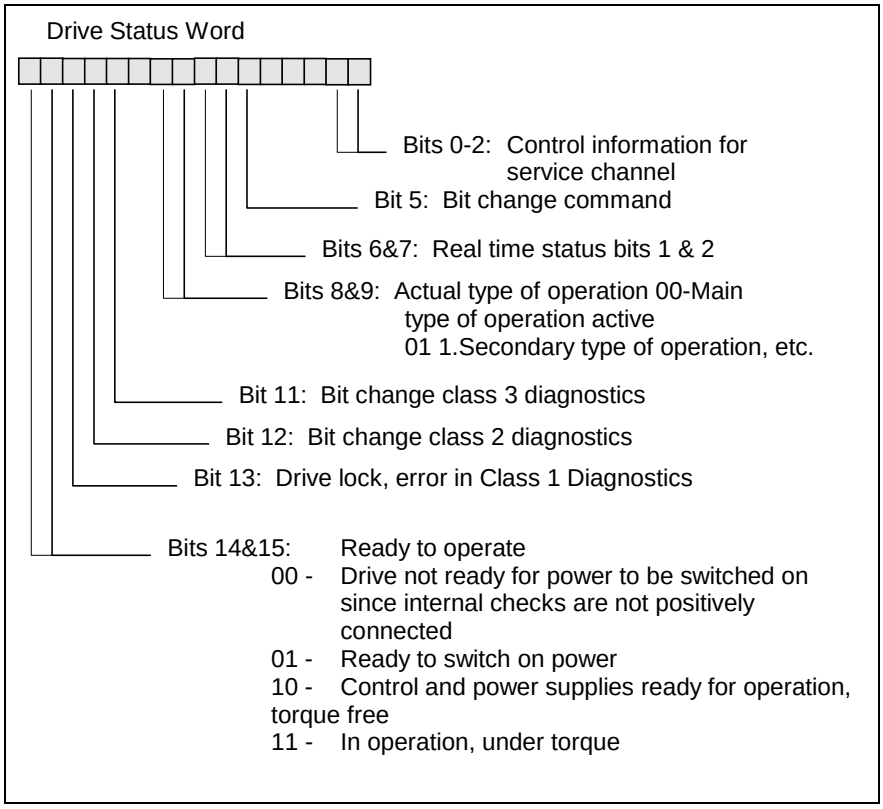

Drive Status Word
Bits 0-2: Control information for service channel
Bit 5: Bit change command
Bits 6&7: Real time status bits 1 & 2
Bits 8&9: Actual type of operation 00-Main type of operation active
01 1.Secondary type of operation, etc.
Bit 11: Bit change class 3 diagnostics
Bit 12: Bit change class 2 diagnostics
Bit 13: Drive lock, error in Class 1 Diagnostics
Bits 14&15: Ready to operate
00 - Drive not ready for power to be switched on since internal checks are not positively connected
01 - Ready to switch on power
10 - Control and power supplies ready for operation, torque free
11 - In operation, under torque

Fig. 4-2: Structure of the drive status word

The drive status word is transferred through the service channel to the control with the parameter **S-0-0135, Drive status word**.

Confirmation of the Drive Enable

The drive confirms the drive enable setting in the drive status word of the drive telegram. Bits 14 and 15 of "10" (control and power section enabled, temporarily) changes to "11" (in operation, temporarily enabled) after the drive enable is activated and has been accepted.

The confirmation of the drive enable setting in the status word is acknowledged after the drive has sufficient time to prepare for its operation mode. For example, the asynchronous motor uses this time to magnetize itself.

If the drive enable is disabled, the drive performs its reaction through parameter **P-0-0119, Best possible deceleration**. Here, time passes between resetting and confirming the reset. This time depends on

- the setting of the parameter P-0-0119, Best possible deceleration
- the existence of a motor brake and its parameterization.
- the velocity of the axis before the reset of the drive enable

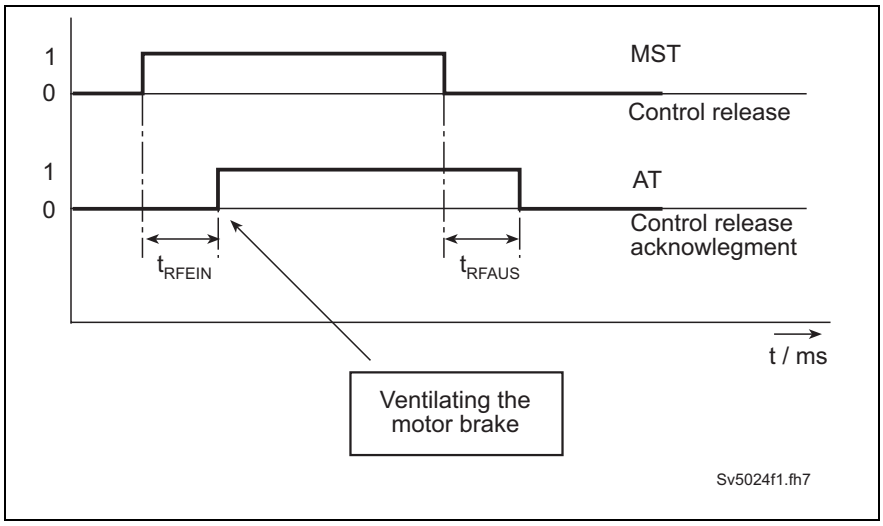


Fig. 4-3: Confirmation of the drive enable

Typical values for t_{RFEIN} are about 8 ms for synchronous motors or 300ms for asynchronous motors.

Note: During the time t_{RFEIN}, the control should set its command values to reach a set velocity of 0. The activation of the optional motor brake takes place after the drive enable confirmation time (0-1 edge from confirmation of drive enable).

4.3 Real-Time Control and Status Bits

In the master control and drive status words, there are 2 configurable real-time bits. The configuration of these binary signals is achieved through parameters

- **S-0-0301, Allocation of Real-Time Control Bit 1**
- **S-0-0303, Allocation of Real-Time Control Bit 2**
- **S-0-0305, Allocation of Real-Time Status Bit 1**
- **S-0-0307, Allocation of Real-Time Status Bit 2**

The parameter number that will be assigned to the corresponding real-time status bit is set here. Bit 0 of this parameter will be sent cyclically to the master or the drive via the real-time status or control bit.

4.4 Transmission of non-cyclical Data through SERCOS

The non-cyclical data (data that is not time-critical) is transmitted via the **service channel**.

The transmission via the service channel is done in several steps for the MDT and AT, and the transmission of an element could last over several Sercos cycles.

The service channel is used for

- **Parameterization** and
- **Diagnostic**

4.5 Startup for the SERCOS Interface

To start the interface you have to:

- **connect the fiber optic cable**
- **set the drive address**
- **check the distortion indicator**
- **set the transmission rate**
- **set the transmission power**

Adjustments of the SERCOS Interface

All settings can be done with switches on the front plate or directly on the plug-in card of the interface module DSS 2.1.

The settings should be complete before connecting communication to the fiber optic ring.

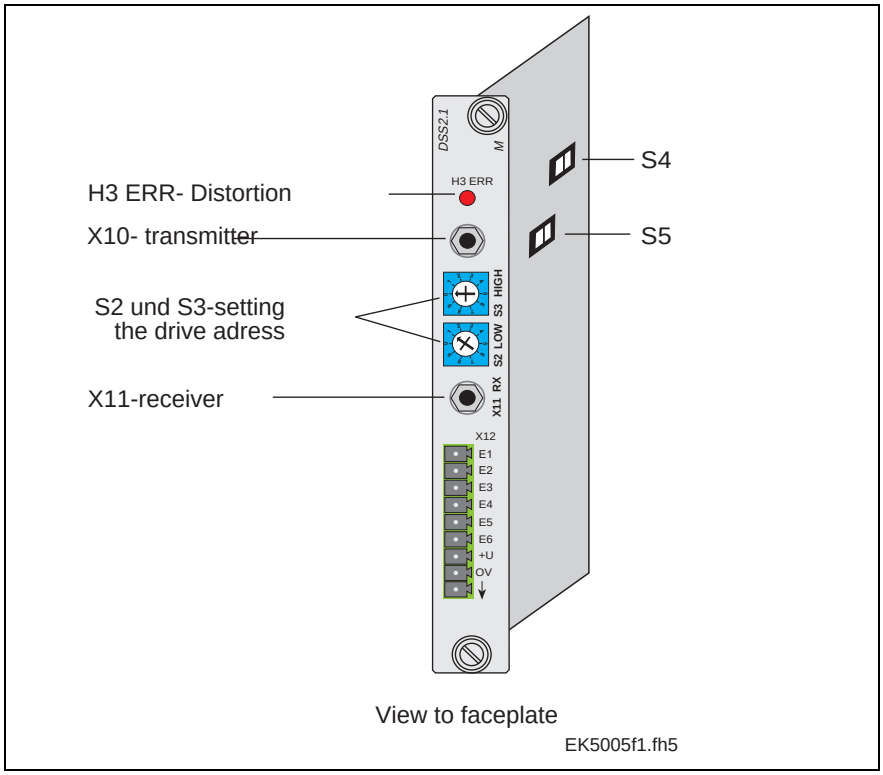


Fig. 4-4: Control communication module DSS2

See also Supplement B,

Diagnostic Explanations: **E410 Slave not scanned or adress 0**.

Connecting the Fiber Optic Cables of the SERCOS Interface

The connection between the control and the digital drives is done with fiber optic cables (LWL).

SERCOS interface (IEC 1491)

The used toplogy is a ring structure according to SERCOS interface (IEC 1491).

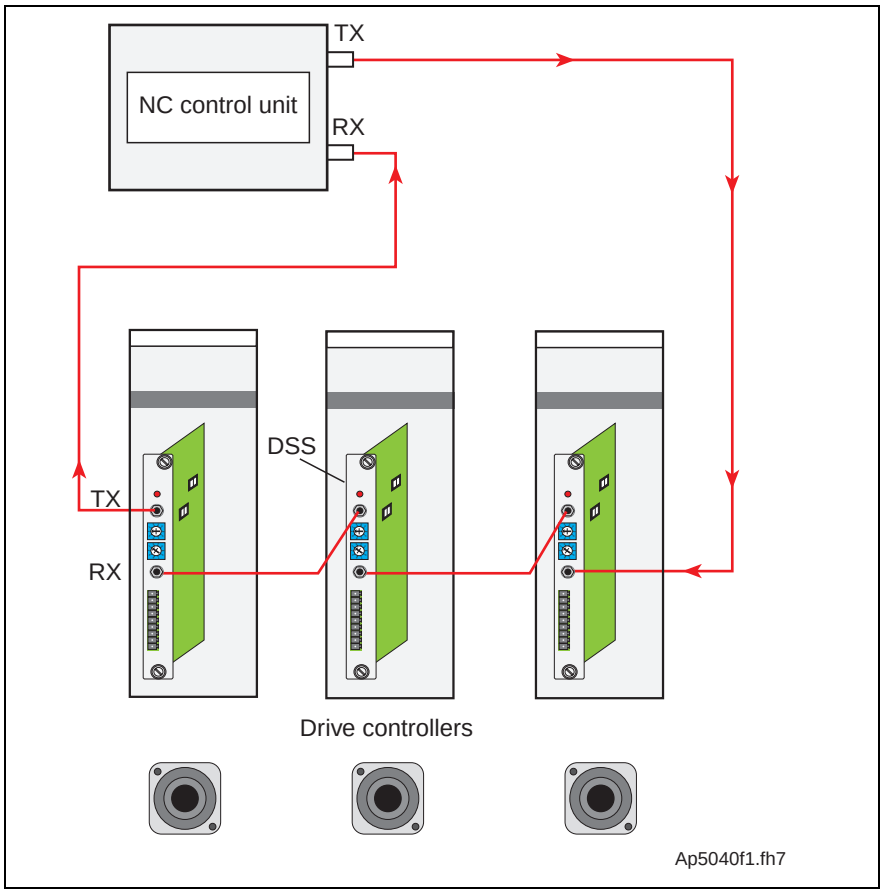


Fig. 4-5: Ring topology

The ring starts and ends at the control.

The optical output of the control is connected with the optical input of the first drive (X11). The output of the latter (X10) is connected with the input of the next drive, and so on. The output of the last drive is connected with the input of the control.

Setting the Drive Address of the SERCOS Interface

The drive address is set on the front plate of the DSS 2.1 through switches S2 and S3. You can set addresses in the range of 0 to 99.

The drive address is not dependent on the sequence of drive connections through the fiber optic ring.

After setting all the addresses, you can switch on the arrangement.

Checking the Distortion Indicator of the SERCOS Interface

The next step is to check whether every station gets a sufficient optical signal level , in other words whether the receiver is not under- or overloaded.

Distortion indicator may not be lit nor glow (flicker)!

For normal operation, the distortion indicator (see also Fig. 4-4: Control communication module DSS2, LED H3 ERR) stays dark.

If it's lit, examine the transmission path in front of that station.

To do this, check the distortion indicators, starting from the transmitter output of the master (control) in the direction of the signal flow.

The distortion indicator at the drives is the LED "H3 ERR".

Check distortion indicator in "direction of the light"

At first, check the 1st drive in the ring. If its distortion indicator is dark, go to the next drive. Do this up to the last drive and then at the master's input (control).

If one of the indicators is lit, check the following:

- Is the transmission (baud) rate set correctly?
- Is the transmission power of the predecessor in the ring correct? (or too high or too low)
- Is the fiber optic cable to the predecessor defective?

Using the Distortion Indicator

A distortion indicator (see also Fig. 4-4: Control communication module DSS2, LED H3 ERR) lights in the following cases:

- wrong transmission (baud) rate
- wrong transmission power
- fiber optic connection defective

Therefore, in the case of a lit distortion indicator lamp, check the following:

Checking the transmission rate

Check the transmission rate at the control and at the implicated drive.

Checking the transmission power

Check the transmision power at the control and at the physical predecessor of the implicated drive. (See Setting the optical Transmission Power).

Checking the fiber optics

Check the fiber optic cable and its connectors from the physical predecessor to the implicated drive.

Transmission Rate of the SERCOS interface

The transmission rate is set by the manufacturer to 2 MBaud. The rate can be set with switch S4 on the interface module DSS 2.1. To do this, you have to remove the card from the slot.

(see also Fig. 4-4: Control communication module DSS2)

Baud Rate:	Switch S4:	Remarks:
2 Mbaud	OFF	Shipping condition
4 Mbaud	ON	

Fig. 4-6: Setting the transmission rate

Setting the optical Transmission Power

DIAX (DSS 2.1)

The transmission power is adjusted with the switches S5A and S5B on the DSS 2.1 card. (see also Fig. 4-4: Control communication module DSS2).

LWL Length	0 .. 15 m	15 m .. 30 m	30 m .. 50 m
	S5A = OFF S5B = OFF	S5A = ON S5B = OFF	S5A = ON S5B = ON

Fig. 4-7: Setting the transmission power for plastic fiber LWL

LWL-Length	0 .. 500 m
	S5A = ON / S5B = ON

Fig. 4-8: Setting the transmission power for Glass fiber LWL

Checking the Fiber Optics

When the transmission rate and power are correctly set, and there is still no communication, the LWL (fiber optic connection) can be defective. In this case, the distortion indicator lamp will light, too.

Reason for a faulty LWL can be damage or bad manufacturing (connector mounting, ...).

Perhaps you can recognize a defective LWL when hardly some light comes out at its end, or that, for example, the optical fiber has been torn back into the connector (check the face of the connector). Further examinations cannot be done with simple means.

The only remedy is an exchange of the defective LWL cable.

4.6 SERCOS Telegram Configuration

To operate the drive properly, the settings of the telegram send and receive times, their lengths, and content have to be transmitted from the SERCOS master to the drive.

Configuration of the Telegram Send and Receive Times

The requirements to calculate the time slot parameter (telegram send and receive times) are stored in the following parameters within the drive:

- **S-0-0003, Minimum AT Transmit Starting Time (T1min)**
- **S-0-0004, Transmit/Receive Transition Time (TATMT)**
- **S-0-0005, Minimum Feedback Acquisition Time(T4min)**
- **S-0-0088, Receive to Receive Recovery Time (TMTSG)**
- **S-0-0090, Command Value Transmit Time (TMTSG)**

The SERCOS Master calculates from the information received from all drives the time slot parameters for the operation of the communication phase 3. Those values are transferred to the drive in communication phase 2 through the parameters

- **S-0-0002, SERCOS Cycle Time (Tscyc)**
- **S-0-0006, AT Transmission Starting Time (T1)**
- **S-0-0007, Feedback Acquisition Starting Time (T4)**
- **S-0-0008, Command Valid Time (T3)**
- **S-0-0009, Beginning Address in Master Data Telegram**
- **S-0-0010, Length of Master Data Telegram**
- **S-0-0089, MDT Transmit Starting Time (T2)**

The drive checks these settings while processing the command **S-0-0127, C100 Communication phase 3 transition check**. The following error messages may appear:

- **C101 Invalid communication parameter (S-0-0021)**
- **C108 Time slot parameter > Sercos cycle time**
- **C109 Position of data record in MDT (S-0-0009) even**
- **C110 Length of MDT (S-0-0010) odd**
- **C111 ID9 + Record length - 1 > length MDT (S-0-0010)**
- **C112 TNcyc (S-0-0001) or TScyc (S-0-0002) error**
- **C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) error**
- **C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)**
- **C115 T2 too small**

Configuration of Telegram Contents

The telegram contents are set through these parameters:

- **S-0-0015, Telegram Type Parameter**
- **S-0-0016, Custom Amplifier Telegram Configuration List**
- **S-0-0024, Config. List of the Master Data Telegram**

However, the drive-directed conditions for the type and number of configured data must be in the set range. Those are provided by the drive in

- **S-0-0185, Length of the config. data record in the AT**
- **S-0-0186, Length of the config. data record in the MDT**
- **S-0-0187, List of Configurable Data in the AT**
- **S-0-0188, List of Configurable Data in the MDT**

The drive checks these settings while processing the command **S-0-0127, C100 Communication phase 3 transition check**. The following error messages may appear:

- **C104 Config. IDN for MDT not configurable**
- **C105 Configurated length > max. length for MDT**
- **C106 Config. IDN for AT not configurable**
- **C107 Configurated length > max. length for AT**

4.7 SERCOS Interface Error

If conditions are detected in the drive that prevent the correct operation of the interface, or if error values are recognized during the initialization phase, the drive responds by resetting to communication phase 0. This means that no drive telegrams will be sent. The drive proceeds with the programmed error reaction (see **P-0-0119, Best possible deceleration**) and waits for the reinitialization of the SERCOS ring through the master.

Possible errors could be:

- **F401 Double MST error shutdown**
- **F402 Double MDT error shutdown**
- **F403 Invalid communication phase shutdown**
- **F404 Error during phase progression**
- **F405 Error during phase regression**
- **F406 Phase switching without ready signal**

Diagnostic of the interface Status

The parameter **S-0-0014, Interface Status** is used to analyze the existing initialization error and the current communication phase.

Error Count for Telegram Interrupts

The drive checks every received master synchronization and master data telegram for

- **the correct receive time set point,**
- **the assigned telegram length and**
- **the correct CRC check sum**

A telegram interrupt is registered with an incrementation in the error counter. For this purpose, these two parameters are used: **S-0-0028, MST error counter** and **S-0-0029, MDT error counter**.

These parameters are cancelled by switching the communication phase from 2 to 3 (S-0-0028) or from 3 to 4 (S-0-0029).

5 Motor Configuration

5.1 Characteristics of the Different Motor Types

You can use the following motor types.

- MDD
- MKD/MKE
- 2AD/1MB/ADF
- LAF/LAR
- LSF
- MBS
- synchron kit motor

The individual motor types differ in the following points:

- Availability of data memory in the motor feedback for all motorspecific parameters
- Synchronous motor - Asynchronous motor
- Linear motor - Rotary motor
- Temperature check can be changed or not.
- Basic load (load default) possible or not
- Motor encoder interface setting can be changed or one setting only
- Start of commutation offset setting command possible or not
- Motor temperature sensor with PTC or NTC features

The individual motor types have the following characteristics

Motor type	Motor feedback data memory	Sync./Async.	Temp. check	Motor-encoder interface	Load default	Temp. Sensor
MDD/MKD/MKE	yes	synchronous	fixed	fixed (1)	possible	PTC
2AD/ADF	no	asynchronous	param.	param.	no	NTC
1MB	no	asynchronous	param.	param.	no	NTC
LAF/LAR	no	asynchronous	param.	param.	no	PTC
LSF	no	synchronous	param.	fixed (8)	no	PTC
2AD with PTC	no	asynchronous	param.	param.	no	PTC
MBS	no	synchronous	param.	param.	no	PTC

Fig. 5-1: Characteristics of the Motor Types

Motor Feedback-Data Memory

The motor feedback data memory contains all motor-related parameters

For MDD, MKD and MKE motors, a motor feedback-data memory is provided, in which all motor-dependent parameters are stored. The drive controller recognizes this automatically and reads those parameters after turning on the device from the data memory with the command **S-0-0128, C200 Communication phase 4 transition check**.

The data memory contains values for the following parameters:

- **S-0-0109, Motor Peak Current**
- **S-0-0111, Motor Current at Standstill**
- **S-0-0113, Maximum Motor Speed (nmax)**
- **S-0-0141, Motor Type**
- **P-0-0018, Number of Pole Pairs/Pole Pair**
- **P-0-0051, Torque/Force constant**
- **P-0-0510, Moment of inertia of the rotor**
- **P-0-0511, Brake current**

Motor types without motor feedback memory necessitate that these parameters are input with initial start-ups using the data sheet.

Linear-Rotational

Depending on the setting of either rotary or linear motor, the units of measurement and the decimal places are changed by the parameters.

Depending on whether a linear or rotary motor is being used, changes in the units and the number of decimal places will be made by the parameters. The following table displays the differences in scaling of these parameters:

ID number:	Rotational:	Linear:
S-0-0100	0,1 As/rad	0,1As/m
S-0-0113	0,0001 RPM	0,0001 mm/min
S-0-0116	Cycles/Rev.	0.00001 mm
P-0-0018	Pole pairs	0,1mm
P-0-0051	Nm/A	N/A
S-0-0348	mAs²/rad	mAs²/mm

Fig. 5-2: Scaling in Linear or Rotary Motors

The selected motor type also affects the scaling of the position data.

For example, it is impossible to set rotary motor settings for linear motors and linear motor settings for rotary motors. This would generate the command error **C213 Position data scaling error** during a phase progression.

Synchronous-Asynchronous

Specific parameters are used only for synchronous motors, others only for asynchronous motors.

There are differences in the use and review of the parameters in the command **S-0-0128, C200 Communication phase 4 transition check**.

They are:

Synchronous:

- **P-0-4004, Magnetizing current** is set to 0
- **P-0-0508, Commutation offset** is checked for validity

Asynchronous:

- **P-0-4004, Magnetizing current** is initialized
- **P-0-0508, Commutation offset** is not checked

Temperature Monitoring

The switch-off limit for the motor temperature check is fixed at one point for MDD-, MKD, MKE motors.

The following parameters are used to monitor the motor temperature : :

S-0-0201, Motor warning temperature

S-0-0204, Motor shutdown temperature

For MDD, MKD and MKE motors, the parameter default values are:

S-0-0201, Motor warning temperature = 145,0°C

S-0-0204, Motor shutdown temperature = 155,0°C

Those default values can be used to help set the parameters for all other motor types. However, you must ensure that the switch-off limit is not set higher than the maximum permissible temperature of the motor.

The maximum input value for **S-0-0201, Motor warning temperature** is **S-0-0204, Motor shutdown temperature**.

If the temperature of the motor exceeds the value in **S-0-0201, Motor warning temperature**, the warning message **E251 Motor overtemp. prewarning** is generated.

If the temperature rises to the motor switch-off temperature, the error message **F219 Motor overtemp. shutdown** is displayed.

The minimum input value for **S-0-0204, Motor shutdown temperature** is **S-0-0201, Motor warning temperature**.

To display the motor temperature, the parameter **S-0-0383, Motor Temperature is used.**

The drive controller checks for proper functioning of the motor temperature monitoring system. If discrepancies occur (temperature drops below -10 degrees), the warning **E221 Warning Motor temp. surveillance defective** will be displayed for 10 seconds. After that, the error message **F221 Error Motor temp. surveillance defective** is generated.

Load Default Feature

MDD, MKD and MKE motors have a data memory in their feedbacks. The data memory contains a set of default control parameters in addition to all motor-dependent parameters.

These parameters are activated with the load default feature.

(See also "Load Default"feature.)

5.2 Setting the Motor Type

The setting of the motor type is done either:

- automatically by reading the motor feedback memory, or
- through the input of the parameter **P-0-4014, Motor Type.**

This depends on the motor type used.

The motor type should be set before start up because the motor type affects the following drive functions:

- a data memory in the motor feedback for all motor-specific parameters
- synchronous motor / asynchronous motor
- linear motor - rotary motor
- temperature monitor can be parametrized or not
- load base value function is possible or not
- motor encoder interface is parametrizable or permanently set
- start of commutation offset setting command possible or not
- motor temperature sensor or with PTC or NTC features

Automatic Setting of the Motor Type for Motors with Feedback Memory

MDD, MKD and MKE motors have a motor feedback data memory, in which the motor type is stored (along with other information). The drive controller recognizes these motor types automatically and the following is executed:

- the value of the parameter **P-0-4014, Motor Type** is set to its proper value and will be write-protected.
- the value of the parameter **P-0-0074, Interface Feedback 1** is set to the defined value for the corresponding motor type.
- all bits except bit 6 are set for absolute/not-absolute to "0" in the parameter **S-0-0277, Position feedback 1 type parameter**.
- all motor-dependent parameters are read out of the motor feedback data storage (see Motor Feedback-Data Memory). The parameter in the motor feedback memory are set with parameter block number 7. These are fetched and copied into the relevant parameters with parameter block number 0.

- the value of **S-0-0201, Motor warning temperature** will be set to 145,0°C, and the **S-0-0204, Motor shutdown temperature** will be set to 155,0°C.
- The value of **P-0-0525, Type of motor brake** is set to "0". The value of **P-0-0526, Brake control delay** is set to 150 ms.

This procedure is followed right after switching on as in the command **S-0-0128, C200 Communication phase 4 transition check**. The command error message, **C204 Motor type P-0-4014 incorrect**, will be generated in case an MDD, MKD and MKE motor is selected in **P-0-4014, Motor type** but the corresponding character sequence cannot be found in the motor feedback data memory.

Setting of the Motor Type through P-0-4014, Motor Type

For motors without motor feedback data memory, you have to set the motor type through **P-0-4014, Motor type**. The following values are planned for the different motor types:

Motor type:	Data:	Remarks:
MDD	1	automatic detection
2AD/1MB/ADF	2	must be set
Linear synchronous motor	3	must be set
Linear asynchronous motor	4	must be set
MKD/MKE	5	automatic detection
2AD with PTC sensor	6	must be set
MBS	7	must be set

Fig. 5-3: Setting the Motor Type

5.3 Synchronous Motors

With this drive firmware it is possible to operate not only Indramat motors with housing such as

- MDD and
- MKD and MKE motors

but also rotary and linear synchronous kit motors such as MSB and LSF. INDRAMAT motors with housing have a stator, rotor, bearings and feedback already built in. They have motor feedback memory in which

- motor parameters
- motor feedback parameters
- synchronous motor-specific parameters and
- default control parameters

are stored. This motors are recognized by the firmware and all settings automatically instituted. With these motors the alignment between the physical rotor positon and the position as supplied by the feedback has been performed at the factory prior to delivery. The resulting offset is stored in parameter **P-0-0508, Commutation offset** in the motor feedback memory (synchronous motor specific parameters).

INDRAMAT motors with housing configured at the factory

This motors can, therefore, immediately be operated without the need for motor-specific settings.

In the case of synchronous kit motors, additional settings must be made at the time of commissioning.

These are:

- motor parameters must be input and
- commutation offset must be determined.

To input the motor parameters, a data sheet from the motor manufacturer can be used. The commutation offset, on the other hand, is determined with the help of command **P-0-0524, Commutation Command.**

WARNING

Error in the control of motor and moving elements.

⇒ Determining the commutation offset must be conducted each time after there has been a change in the mechanical relationship between motor feedback and motor. This is the case, for example, when the encoder or motor are replaced.

Determining the commutation offset

A condition for a temporally constant torque of the synchronous motor is the synchronism between the stator current vector and the vector of the rotor flux. If the angle between these two vectors, hereinafter termed γ equals 90°, then the motor will generate its maximum torque. A synchronous motor is operated in this state.

In order to set the stator current vector correctly, the data on γ is needed. This generally necessitates a measuring system which can supply absolute information about this angle. Once the measuring system is mounted to the motor, only the absolute raw position is at first available. The difference between raw positon and absolute angle of rotor and stator field is designated the commutation offset. This is generally stored in the feedback memory in the form of parameter **P-0-0508, Commutation offset.**

If this parameter is to be determined, then the commutation setting function must be activated. The following two parameters are intended for this purpose:

- **P-0-0523, Commutation, Probe value**
- **P-0-0524, Commutation Command**

Two different processed have been implement. These are:

- mechanical reference between rotor and stator is entered in P-0-0523 and then commutation offset is computed while command P-0-0524 is executed.
- Automatic determination of the commutation offset by switching defined stator current vector on with accompanying automatic measurement.

Which process is used at the state of the **P-0-0524, Commutation Command** depends on the type of motor which has been mounted. It thus applies:

Motor type	Process
LSF (synchronous linear)	reference between rotor and stator is measured (see item 1)
MSB (synchronous rotary)	automatic determination (see item 2)

Fig. 5-4: Setting the commutation offset

Note: To successfully conduct the command, the motor measuring system must be completely operable. The rotational direction of the measuring system must also be set! (See "Motor encoder“)

Determining the commutation offset in rotary synchronous motors (MSB)

In rotary synchronous motors, the commutation offset is determined by switching to a defined stator current vector. The rotor goes into a torque-free position. If the raw position of this torque-free position is measured, then it can be used to determine the commutation offset. This procedure is repeated ten (10) times, whereby the points of measurement are distributed over the entire mechanical rotation of the rotor. The mean value of these ten measurements equals the commutation offset.

Amount and angle of the stator current are illustrated below.

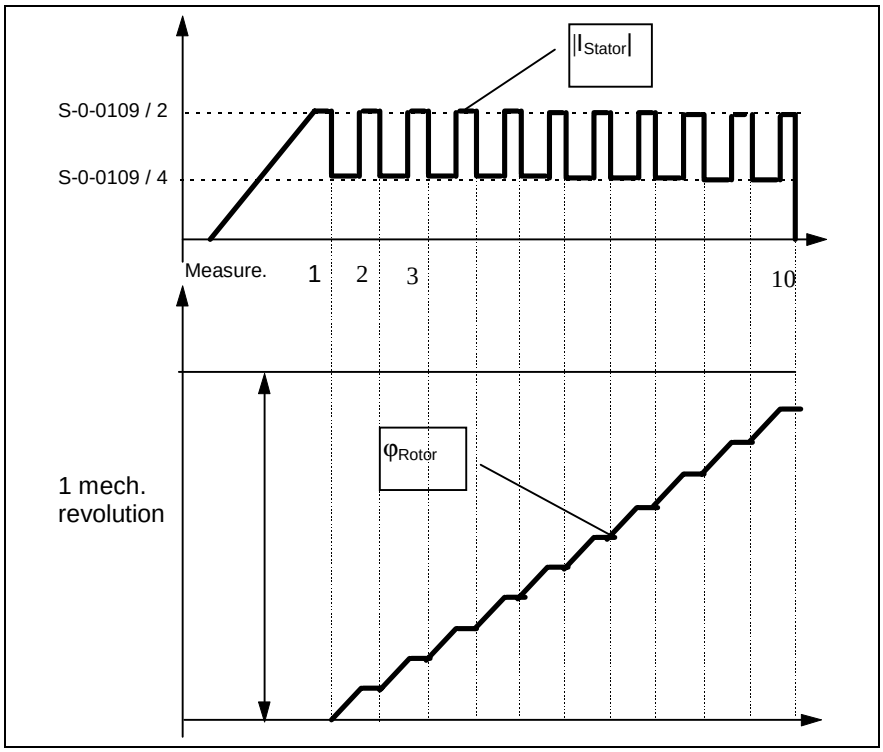


Fig. 5-5: Current and position when determining commutation offset in MSB motors

At the start of the command, the drive must be in **torque mode.** If not, then the command error

D301 Drive not ready for commutation command

is generated. The value of **P-0-0508, Commutation offset** is stored in the motor feedback memory, if one is available. Allowable motor encoders for rotary synchronous motors must supply an absolute position of at least one pole pair after powering up. For this reason, the following values for **P-0-0074, Interface Feedback 1** are permitted:

Possible values for P-0-0074, Interface Feedback 1 with motor type MSB (rotary synchronous kit motor)	**Motor encoder interface**
1	DSF or resolver with feedback data storage
8	Heidenhain encoder with Endat Interface
10	Resolver without feedback data storage *)
11	Resolver + incremental encoder with sine signals without feedback data memory *)

Fig. 5-6: Possible motor encoders with motor types "rotary synchronous kit“

Note: *) With this type of motor encoder, there is no feedback memory. The parameter **P-0-0508, Commutation offset** is stored in the programming module. When exchanging the programming module, the value of parameter **P-0-0508, Commutation offset** must be re-entered or assumed by storing the parameter and loading from the previous module.

Determining the commutation offset in linear synchronous motors (LSF)

The commutation offset in linear synchronous motors (LSF) is fixed by measuring the distance between front end of primary part and setting device of the secondary part. This value plus the motor type dependent primary nominal value is entered in parameter **P-0-0523, Commutation, Probe value.** Then the command **P-0-0524, Commutation Command** is started. The drive computes the commutation offset from the measured value. To successfully conduct the command, the following conditions must be met:

- The direction of movement of the measuring system must be set so that if the primary part is moving towards the front end at which the power cable of the motor branches off (front end 1, see picture 2), then **S-0-0051, Position Feedback Value 1 (Motor Feedback)** is moving in a positive direction. (With inverted position polarity!) If this is not the case, then the direction of movement of the motor encoder must be inverted. Do this in bit 3 of **S-0-0277, Position feedback 1 type parameter.**
- The power cables of the motor must be correctly connection (three phases must be assigned).
- The drive must be in **A013 Ready for power on.**
- A characteristic value, K_{entire}, for the primary part of the motor must be determined.

If these conditions have been met, then the distance between front end 2 of the primary part of the setting device (d) can be measured and this value plus the primary part characteristic value K_{entire} can be entered in P-0-0523. Front end 2 means the front end opposite the end where the power cables of the motor emerge.

$$P\text{-}0\text{-}0523 = d + K_{entire}$$

P-0-0523: value determined for parameter P-0-0523
d: measured distance between front end of primary part and setting device
K_{entire}: primary part characteristic value

Fig. 5-7: Determining the measured value of the commutation offset setting in LSF motors

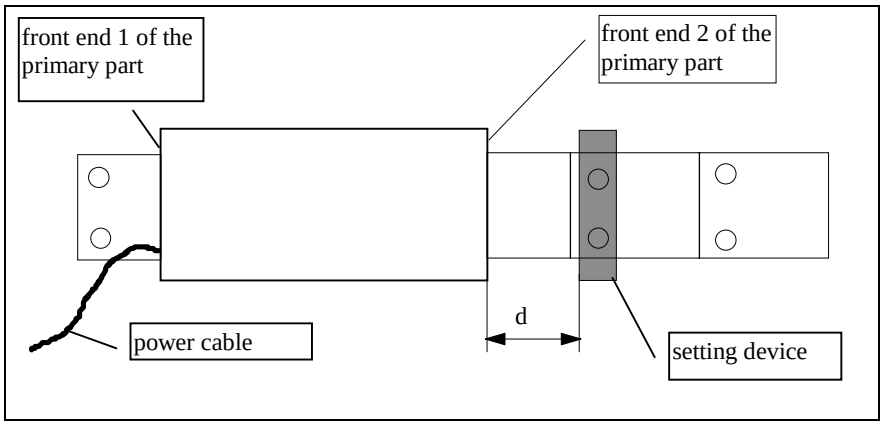


Fig. 5-8: Overview of determining the commutation offset in LSF

Finally, the command **P-0-0524, Commutation Command** is started. The commutation offset is computed during this process.

At command start, the drive must be **A013 Ready for power on.** If not, then command error

D301 Drive not ready for commutation command

is generated. The command must be cleared when all is completed!

5.4 Asynchronous Motors

With DIAX-Firmware, you can use asynchronous motors in the entire rpm range, including constant power range.

In addition to the general motor parameters, you have to set the following asynchronous motor parameters for specific motors according to the Indramat default:

- **P-0-4004, Magnetizing current**
- **P-0-4012, Slip factor**
- **P-0-0530, Slip Increase**
- **P-0-0531, Stall Current Limit**
- **P-0-0533, Flux Loop Prop. Gain**
- **P-0-0534, Flux Loop Integral Action Time**
- **P-0-0535, Motor voltage at no load**
- **P-0-0536, Motor voltage max.**
- **P-0-0537, S1-Kink-Speed**

The user has two additional parameters to adjust the drive to his requirements.

- **P-0-0532, Premagnetization factor**
- **P-0-0538, Motor Function Parameter 1**

Basics for the Asynchronous Motor

Asynchronous motors are divided in three working ranges.

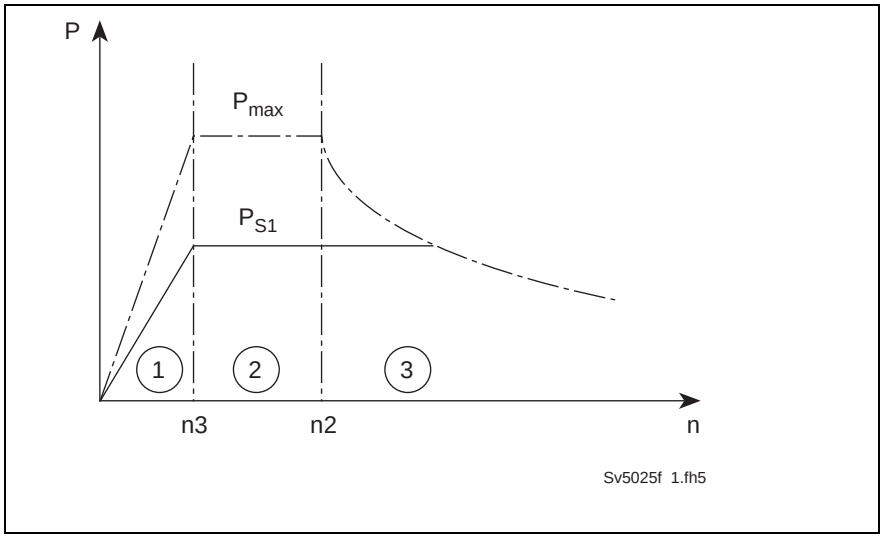


Fig. 5-9: Subsections of Work Ranges

Section 1:

The **Basic RPM Range** is defined by a constant torque and a fixed torque/force constant (parameter P-0-0051). In idle, the programmed magnetization current flows. The motor voltage is less than the maximum control output voltage. The corner RPM n1 is directly proportional to the DC bus voltage.

Section 2:

Range of Constant Power. The motor voltage is constant; the idle voltage and the corresponding magnetization and torque constants fall with increasing velocity. The slip is increased correspondingly.

The adjustment of magnetization current and slip is executed automatically by the vector control. The voltage is decreased during idle to the motor idle voltage (P-0-0535), and when fully in use it is increased to the maximum motor voltage (P-0-0536).

Section 3:

Range of decreasing Peak Power. The motor works at the sweep limit; an actual sweep is eliminated with the vector control. According to the parameter "sweep current limit," the peak current will be decreased enough so that the maximum power cannot be exceeded. An increase in current would lead only to wasted power and reduced shaft power. The peak power in range 3 is proportional to the square of the DC bus voltage. It is ensured that the maximum power always is reached for each DC bus voltage without parameter adjustment.

The power in range 3 cannot be extended through the use of more powerful controllers.

Torque Evaluation

In contrast to the RAC, 100% torque is not the peak value, but the motor set value according to the ID plate. Since the peak torque of asynchronous motors is limited to 2.5 times of the set value, you can reach torques up to 250%.

The significance of the torque values changes in the field-weakening range since the torque in the controller is set equal to the torque-producing current Iq. The torque, however, is the product of Iq and air gap induction, which decreases in the field-weakening range.

The assignment of the torque values in the different velocity ranges is displayed in the following picture:

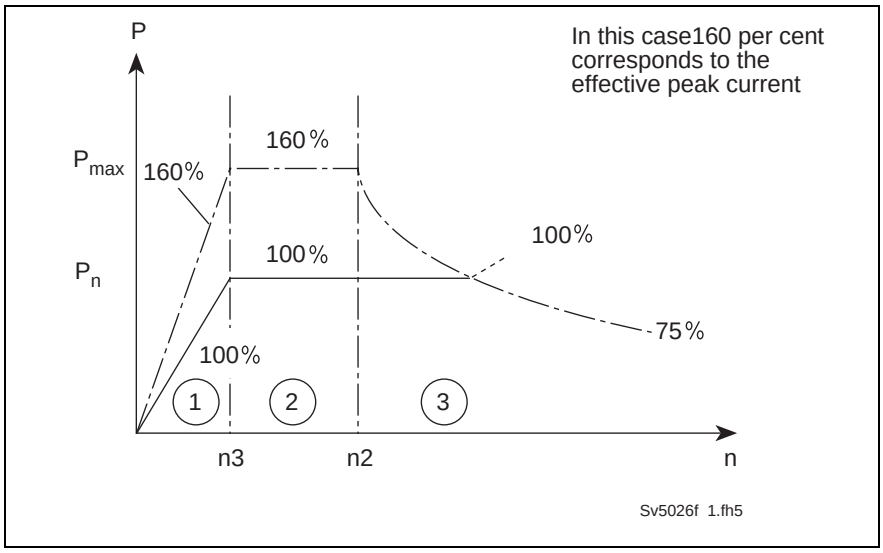


Fig. 5-10: Torque assignment

In range 1, the torque value is the actual torque. 100% = rated torque.

In range 2, the torque value is equal to the power.
100% = rated power according to selection list. (The rated power of the motor rating plate is not relevant here since it could relate to another DC bus voltage.)

Range 3 is similar to the evaluation of range 2, except that the preset torque decreases in correspondence to the increasing velocity of the peak power. For high velocity, the maximum torque value can drop below 100%.

In braking mode, you can reach 50% higher torque values in this range than in driving mode.

User-defined Settings for the Asynchronous Motor

To operate an asynchronous motor, you have to set the specific DIAX motor parameters in the controller. The parameters are stored on the DSM module and are therefore transferable to another controller.

Note: Motor-specific parameters are used by all DIAX controls in the same manner. The resulting power characteristics curve depends on the current and especially on the DC bus voltage. Several additional parameters are available so the user can optimize the drive to his requirements.

Scaling Factor Pre-Magnetizing

With the pre-magnetizing scaling factor (P-0-0532), you can set the active magnetization current.

The following applies:

Effective magnetization current = magnetization voltage • scaling factor pre-magnetizing

Fig. 5-1: Calculation of the Effective Magnetization Current

If the pre-magnetizing scaling factor is at 100%, the motor is completely magnetized. There is a linear connection between set current and torque according to the torque constant P-0-0051. The torque builds up without delay. The drive has perfect servo properties.

The disadvantages are the high iron loss and the higher noise level in idle and in work mode, especially at 4kHz switching frequency, when the full magnetization current is flowing. For main spindle applications, it has proven successful to reduce the pre-magnetizing scaling factor to 50%. Through this procedure, the motor stays cooler and is not as noisy, while peak power is maintained. The extended start control time (only for jumps that exceed half the peak torque) and the missing linearity of torque and voltage do not distort the main spindle drives.

The qualitative connection between the pre-magnetizing scaling factor and drive behavior is displayed in the following graphic:

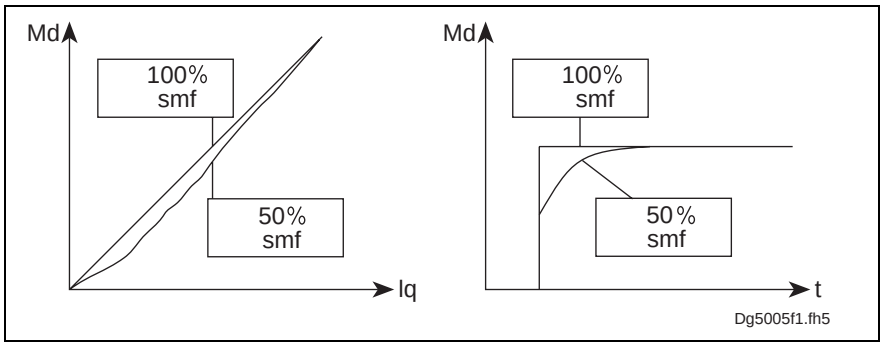


Fig. 5-11: Connection of pre-magnetizing scaling factor and drive behavior

The torque buildup is delayed by about 200ms during pre-magnetizing because the air gap range can only increase slowly in relation to the rotor time constant.

By reducing the pre-magnetizing scaling factor, you can achieve a better synchronous operation (in the one-thousandth degree range). This will reduce distorted torques, which result from saturation effects in the motor and from unavoidable deviations from an ideal sine form. To keep the torque linear in this case, the slip factor must be increased in the same measure at which the pre-magnetizing scaling factor was decreased. Warning: Torque constant, continual torque and peak torque are reduced!

Example: The synchronous operation should be improved in a servo drive. The pre-magnetizing scaling factor is set to 40%, and the slip factor is set to 2.5 times of the original value. The continual and peak torque decrease to approximately 40%. The reference speed increases to 2.5 times the velocity.

"S1-Operation" Function

By setting Bit 0 in the parameter "Motor function parameter," the function "S1-Operation" is activated.

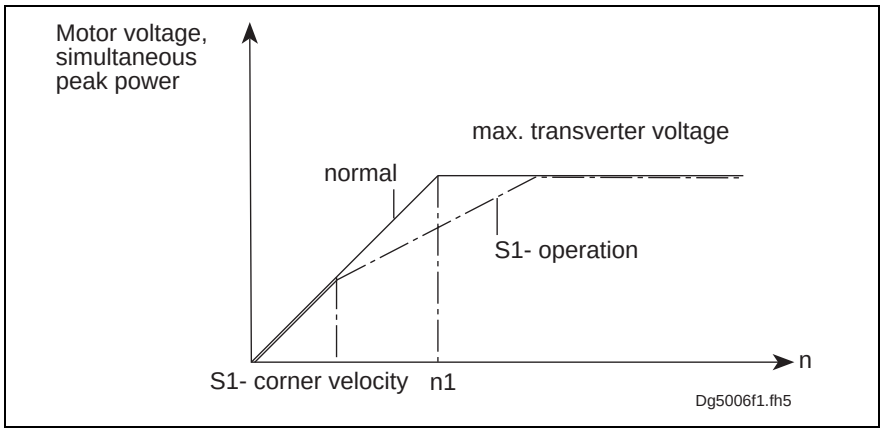


Fig. 5-12: Operating characteristics of the reference speed

Already from the S1 reference speed (corner velocity) (P-0-0537), a controlled field weakening prevents a continued increase in iron losses. If the motor-typical S1 kink speed drops drastically below the DC bus voltage and the motor-type dependent kink speed n1, then the iron loss in range S1 kink speed is kept constant until the output voltage is reached. The peak torque does decrease, but the motor losses are lower for resistances ≤ set rated loads. So activation of "S1-Operation" is advantageous for drives that are used with constant velocity in the medium RPM range, as would be the case for printing machines.

The S1 kink speed can be drastically below the electrical kink speed n1 especially with non-ventilated motors.

The S1 operation also can be used in connection with the reduced pre-magnetizing scaling factor.

Motor Function Parameter 1

Bit No.	Meaning
#0	= 0: no magnetizing current drop = 1: S1-magnetizing current drop active since the S1 kink speed

Fig. 5-13: Meaning P-0-0538, motor function parameter

5.5 Motor Holding Brake

The drive controllers of the DIAX series allow for control of a motor holding brake. This is used to prevent undesired axis movements when the controller enable is turned off.

Note: The holding brake is not designed for regular operation. The brake will be worn out after 20.000 rotations in engaged state.

To set the motor holding brake, use the parameters

- **P-0-0525, Type of motor brake**
- **P-0-0526, Brake control delay**
- **P-0-0511, Brake current**

For motors with motor feedback data memory, the parameters for the motor holding brake are set automatically

The parameters will be set automatically for the MDD, MKD or MKE motors. For all other motor types, you have to retrieve the values from the data sheet for the motor or the motor brake.

Connection of the Motor Holding Brake

You connect the motor brake through connector X6 on the drive controller.

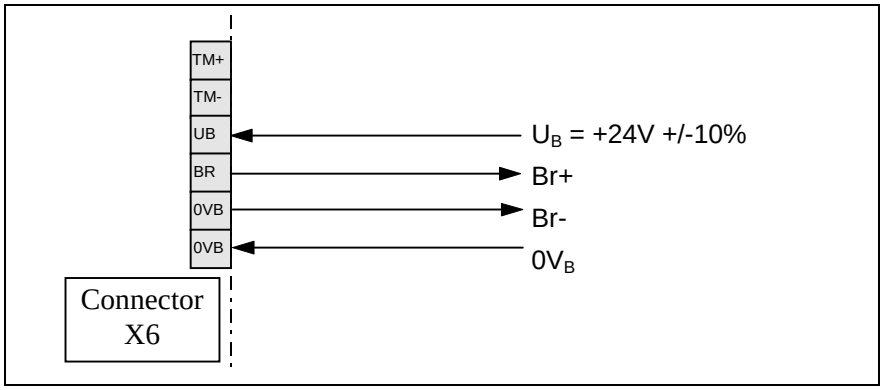


Fig. 5-14: Connection of the motor brake

To provide the required brake control voltage, you have to connect +24V external voltage. The brake is controlled with the contacts Br+ and Br-.

Note: To ensure error-free monitoring, a connection between the 0V of the brake supply and the 0V of the drive controller is recommended.

Setting the Motor Brake Type

In **P-0-0525, Type of motor brake** , you set either a self-locking (MDD, MKD or MKE motors) or a self-releasing brake.

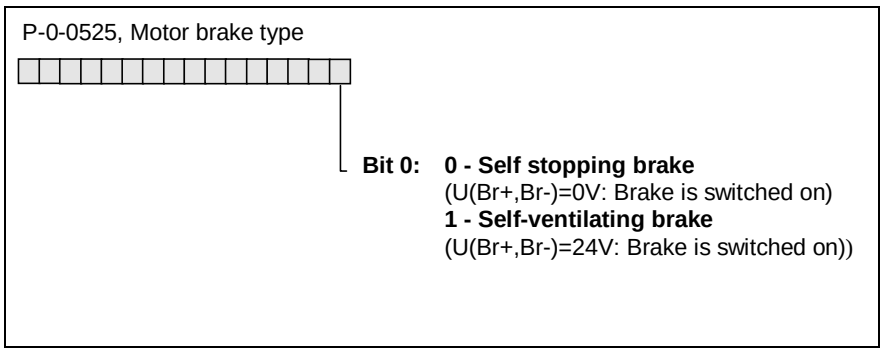

P-0-0525, Motor brake type
Bit 0:
0 - Self stopping brake
(U(Br+,Br-)=0V: Brake is switched on)
1 - Self-ventilating brake
(U(Br+,Br-)=24V: Brake is switched on))

Fig. 5-15: Setting the motor brake type

Setting the Brake Control Delay

In **P-0-0526, Brake control delay**, you set the time it can take for the brake to become effective.

The standard value for the direct connection of holding brakes for Indramat motors should be set at 100 ms.

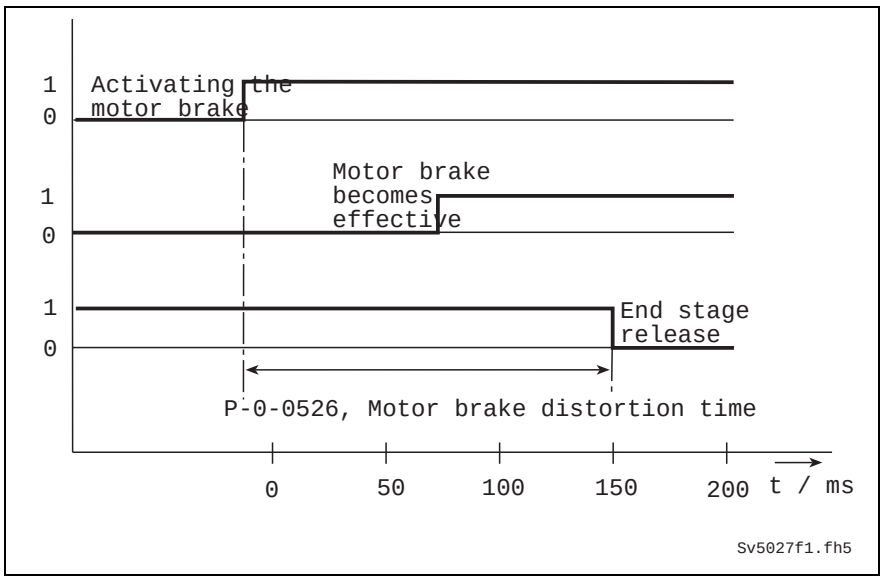


Fig. 5-16: Setting the brake control delay

Setting the Motor Brake Current

The motor holding brake is controlled by the drive controller with connector X6. The supply voltage of +24V for the brake control has to be fed externally. If the brake is actuated (electrically released or electrically engaged), the current flowing through the connection contacts of the brake will be monitored.

Note: The maximum output voltage for the control of the motor brake is 2,0 A.

In **P-0-0511, Brake current**, the rating of the brake current is defined. If the actual brake current after actuation is outside (0,4..1,6) • P-0-0511, then the error message **F268 Brake fault** will be generated.

The monitoring of the brake current is deactivated when a **P-0-0511, Brake current** equal to 0 is entered.

Notes

6 Operating Modes

6.1 Operating Modes - Definition

Operating modes define how command values should be processed. With the help of the parameters

- **S-0-0032, Primary Mode of Operation**
- **S-0-0033, Secondary Operation Mode 1**
- **S-0-0034, Secondary Operating Mode 2**
- **S-0-0035, Secondary Operating Mode 3**

4 different operating modes can be preselected simultaneously.

The following gives a more detailed explanation of the operating modes supported by the DIAX software.

6.2 Basic Operating Modes

Torque/Force Control

A torque/force value is commanded to the drive in the **Torque/Force Control** operating mode. When the operating mode is activated, the diagnostic message reads **A100 Drive in Torque Mode**.

The command value is specified in the parameter **S-0-0080, Torque/Force Command**.

Monitors specific to this operating mode are:

- Monitoring of the actual speed at 1.125 times the value of the parameter **S-0-0091, Bipolar Velocity Limit Value**. (See also"Limiting to Bipolar Velocity Limit Value ")

If this value is exceeded, the error **F879 Velocity limit S-0-0091 exceeded** is generated.

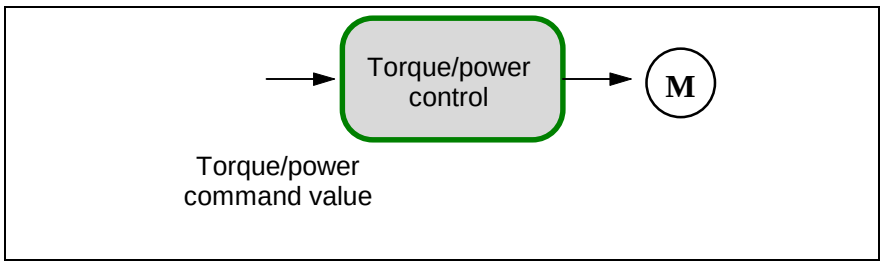


Fig. 6-1: Torque/Force Control Block Diagram

Torque/Force Controller

The command value in **S-0-0080, Torque/Force Command** is limited with the effective peak current **P-0-4046, Active peak current**. The effective peak current is derived from the current and torque/force limit.

(See also"Current Limit and "Torque/Force Limiting")

The torque/force generating command current "Iqcom" is derived according to these limits. This is the command value for the (effective) current regulator.

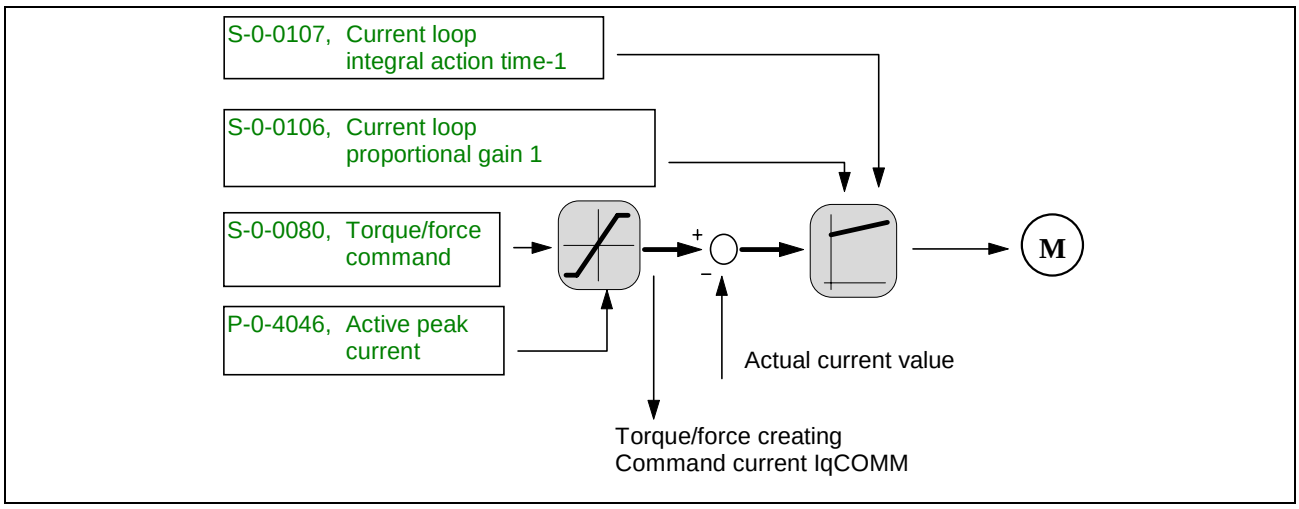


Fig. 6-2: Torque/Force Controller

Velocity Control

A velocity value is commanded to the drive in the **Velocity Control** operating mode. The diagnostic message reads **A101 Drive in Velocity Mode** when the operating mode is active.

The command values are specified in the parameters **S-0-0036, Velocity Command Value** and **S-0-0037, Additive velocity command value**.

Monitors specific to this operating mode are:

- The parameter **S-0-0036, Velocity Command Value** is limited to the value of the parameter **S-0-0091, Bipolar Velocity Limit Value**. This generates the warning **E263 Velocity command value > limit S-0-0091** .

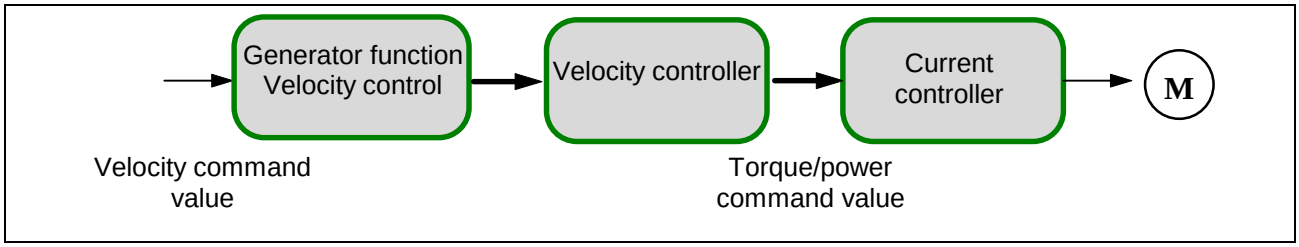


Fig. 6-3: Velocity control block diagram

Generator function Velocity control

The given S-0-0036, Velocity Command Value is limited to **S-0-0091, Bipolar Velocity Limit Value**. Is the command value higher the message **E 263, Velocity Command Value > Limit S-0-0091** is shown. Than the acceleration is limited with **P-0-1201, Ramp 1 pitch** and the jerk is limited with **P-0-1222, Velocity command filter**.

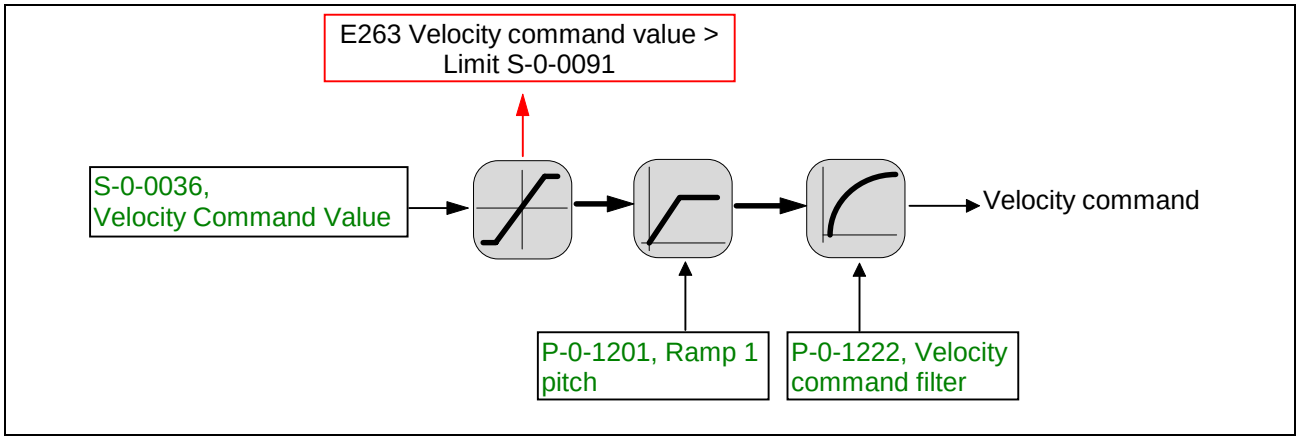

E263 Velocity command value > Limit S-0-0091
S-0-0036, Velocity Command Value
Velocity command
P-0-1201, Ramp 1 pitch
P-0-1222, Velocity command filter

Abb. 6-4: Generator Function: Velocity Controller

See also "Velocity Controller"

See also "Current Controller".

Velocity Controller

The effective velocity command value is added with **S-0-0037, Additive Velocity Command Value**.

Further he is limited to **S-0-0091, Bipolar Velocity Limit Value**.

(See also "Limiting to Bipolar Velocity Limit Value")

If the resulting command value is at the limit, the warning **E259 Command velocity limit active** is displayed.

The velocity control difference is produced by including the actual velocity in the control loop. The raw feedback velocities of the motor and, if available, the external encoder can be combined into an effective actual velocity value. (See also" Setting the Velocity Mix Factor".)

Via **P-0-0004, Smoothing Time Constant** you can limit the band of the control difference for the current controller.

The output from the velocity controller is added with a feed forward component when a lagless position control mode is activated and **S-0-0348, Acceleration Feedforward prop. Gain** is set to a non-zero value.

This value is commanded according to the current and torque/force limit.

(See also" Current Limit" and "Torque/Force Limitation".)

To filter mechanical resonance frequencies, a notch filter can be applied to this torque/force command value. Using parameter **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop** the frequency range which must be suppressed and be parametrized.

(See also "Setting the Velocity Controller".)

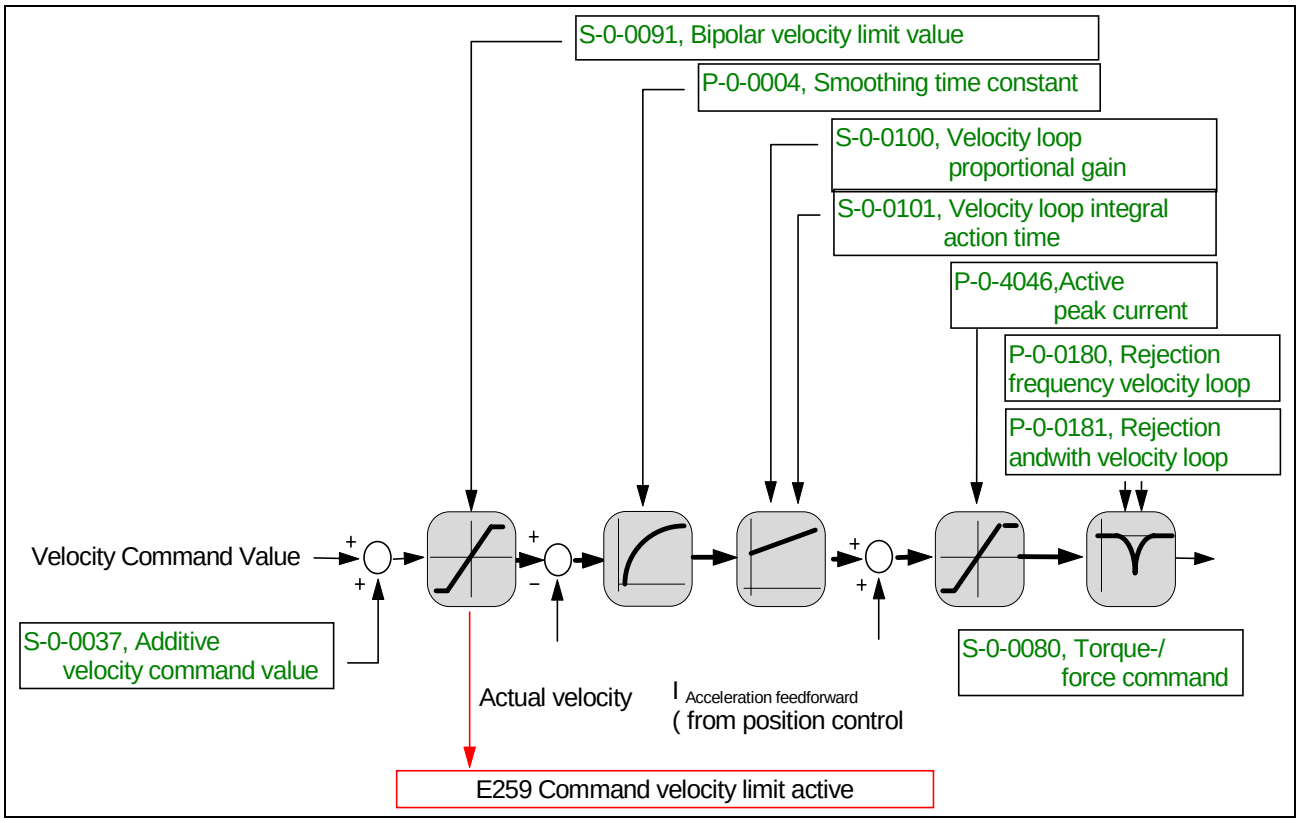

S-0-0091, Bipolar velocity limit value
P-0-0004, Smoothing time constant
S-0-0100, Velocity loop proportional gain
S-0-0101, Velocity loop integral action time
P-0-4046,Active peak current
P-0-0180, Rejection frequency velocity loop
P-0-0181, Rejection andwith velocity loop
Velocity Command Value
S-0-0037, Additive velocity command value
Actual velocity
I Acceleration feedforward
(from position control
S-0-0080, Torque-/ force command
E259 Command velocity limit active

Fig. 6-5: Velocity Controller

See also "Generator function Velocity control"

See also "Current Controller".

Current Controller

The current controller is parameterized with **S-0-0106, Current loop proportional gain 1** and **S-0-0107, Current loop integral action time 1**.

(See also "Setting the Current Controller".)

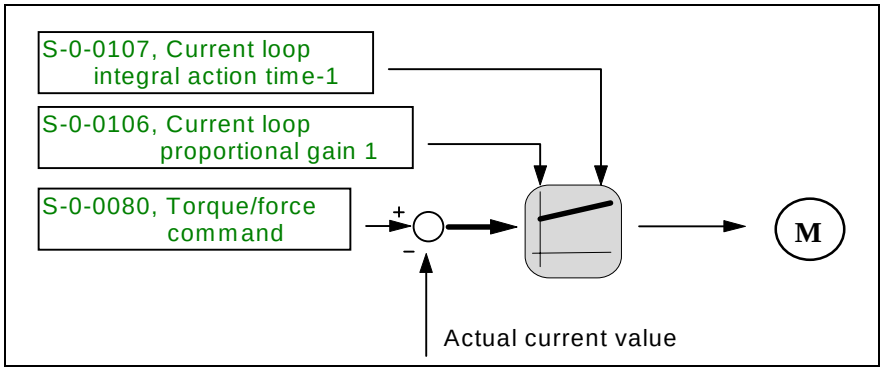


Fig. 6-6: Current Controller

Position Control

A position value is commanded to the drive every NC-cycle time in the **Position Control** operating mode. When this mode is activated, the diagnostic message is one of the following:

- **A102 Position Control Encoder 1**
- **A103 Position Control Encoder 2**
- **A104 Position Control Encoder 1 Lagless Positioning**
- **A105 Position Control/ Encoder 2 / Lagless Positioning**

The command value is specified in the parameter **S-0-0047, Position Command Value** .

Monitors specific to this operating mode are:

- Monitoring the command velocity at the value of the parameter **S-0-0091, Bipolar Velocity Limit Value**.

If this value is exceeded, the error **F237 Excessive position command difference** is generated.

The command value specified in **S-0-0047, Position Command Value** is interpolated within the NC cycle time and is then given to the position controller.

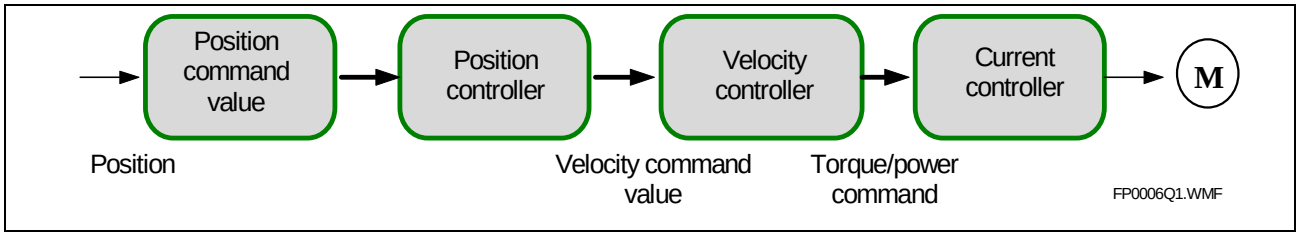


Fig. 6-7: Position control block diagram

Generator Feature: Position Command Value Interpolator

A command velocity is formed from two successive position command values. The **S-0-0001, NC Cycle Time (TNcyc)** acts as the time base.

The instructions for calculating the command velocity are as follows:

$$Vcommand = \frac{Position\,command\,value(k) - Position\,command\,value(k-1)}{S-0-0001}$$

Vcommand: Command velocity

Fig. 6-1: Calculating the command velocity

This velocity is monitored to see if it exceeds **S-0-0091, Bipolar Velocity Limit Value** (see also Position Command Value Monitoring. If **S-0-0091** is exceeded, the error **F237 Excessive position command difference** is generated.

The commanded position profile can be filtered with the parameter **P-0-0099, Position command smoothing time constant**.

The position loop is closed every 250 µs. The position command value is also fine interpolated within the NC cycle time.

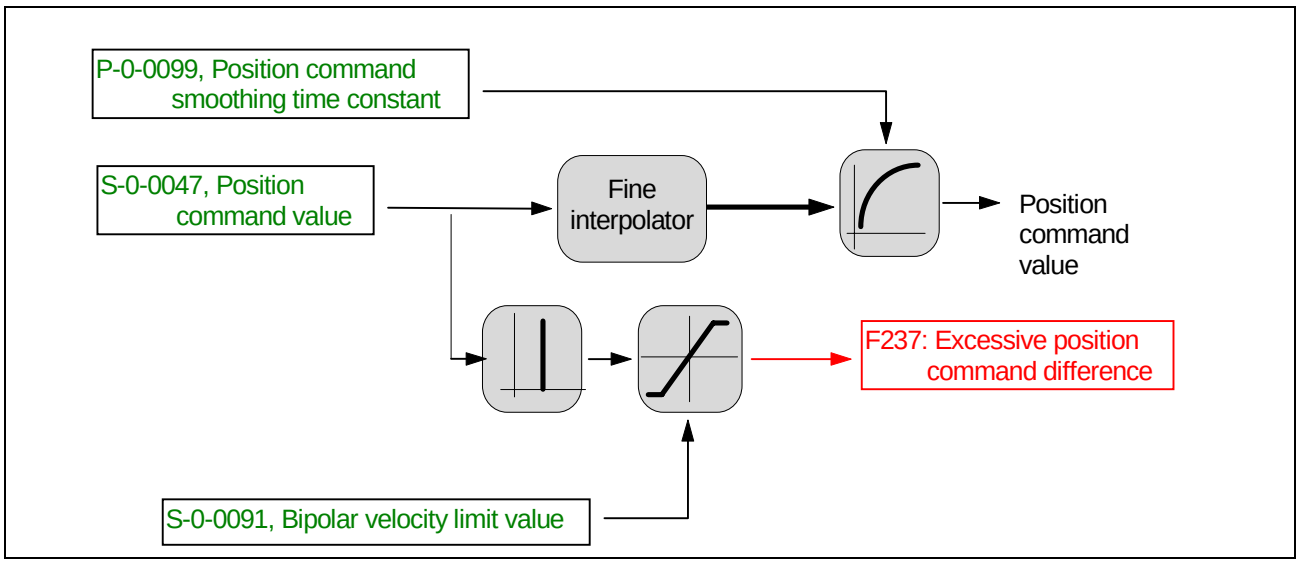

P-0-0099, Position command smoothing time constant
S-0-0047, Position command value
Fine interpolator
Position command value
F237: Excessive position command difference
S-0-0091, Bipolar velocity limit value

Fig. 6-8: : Generator function position command value interpolator

See also Current Controller

See also Velocity Controller

See also Position Controller

Position Controller

The position controller error is computed from the effective position command value from the generator function of the active operating mode and the actual position value (motor encoder or external encoder) used for the controller.

This is given to the position controller, whose control gain is set with **S-0-0104, Position Loop Kv-Factor** .

Bit 3 in the operating mode parameters (S-0-0032..35) indicates if positioning should be subject to the following errors.

With lagless position control, an acceleration feed forward component can be included with parameter **S-0-0348, Acceleration Feedforward prop. Gain**.

(See also"Setting the Acceleration Feed Forward".)

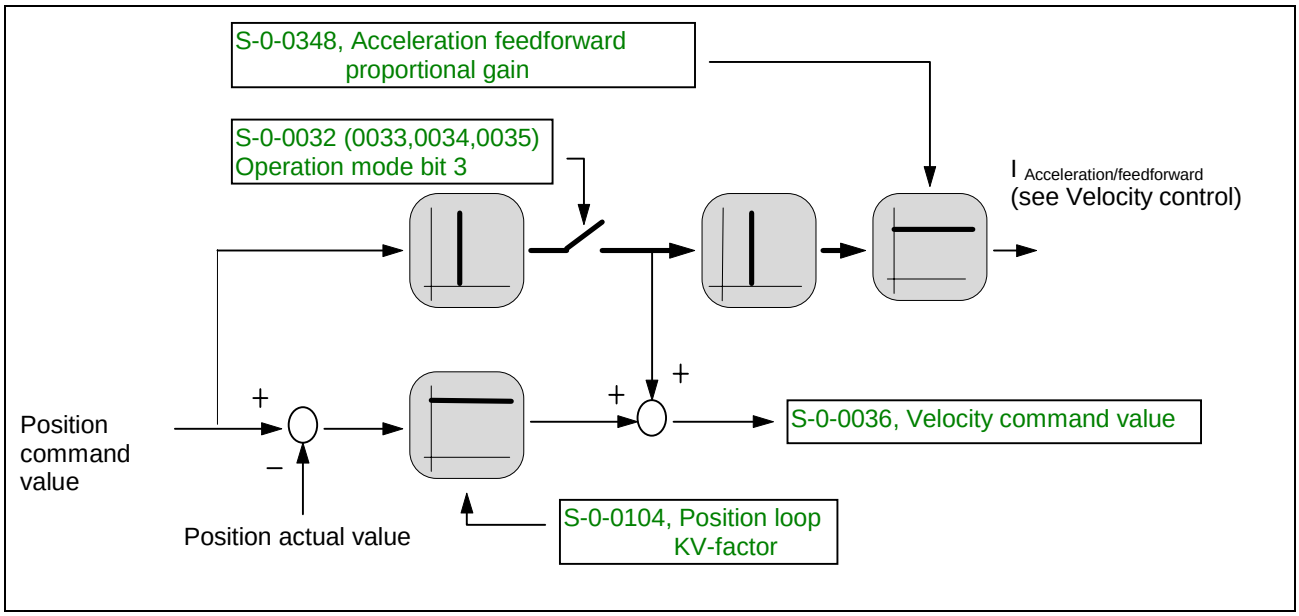


Fig. 6-9: Position controller block diagram

See also Current Controller

See also Velocity Controller

See also Generator Feature: Position Command Value Interpolator.

Position Command Value Monitoring

If the drive is operated in the position control mode with cyclical position commands, new position values are transmitted to the drive every SERCOS cycle. The difference between the current and the last position command value is checked for validity.

Reasons monitoring is activated:

- Erroneous control system command values
- Command value transmission error

If the **Position Control** operating mode is active, the velocity produced by the difference in successive values of parameter **S-0-0047, Position Command Value** is compared to

- **S-0-0091, Bipolar Velocity Limit Value**

S-0-0001, NC Cycle Time (TNcyc) acts as the time base for converting the position command value differences into a velocity. It is assumed that position command values are given cyclically in the NC cycle time. This is normally the case in the position control operating mode.

If the command velocity resulting from the position command value exceeds **S-0-0091, Bipolar Velocity Limit Value**, the error

- **F237 Excessive position command difference**

is generated. For diagnostic purposes, both of the parameters

- **P-0-0010, Excessive Position Command Value**
- **P-0-0011, Last valid Position Command Value**

will be saved. The velocity produced by the difference of the two values generated the error.

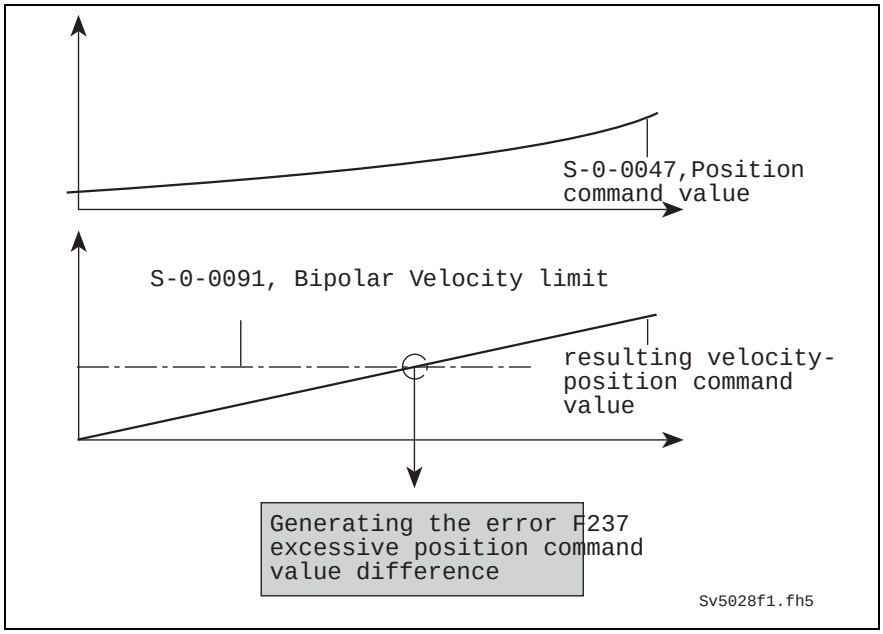

S-0-0047,Position command value
S-0-0091, Bipolar Velocity limit
resulting velocity-position command value
Generating the error F237 excessive position command value difference
Sv5028f1.fh5

Fig. 6-10: Monitoring the position command value differences and generating the error **F237 Excessive position command difference**

Setting Position Command Value Monitoring

The position command value monitor works with the parameter **S-0-0091, Bipolar Velocity Limit Value**. S-0-0091 should be set approx. 5..10% above the planned maximum velocity of the shaft.

Drive Internal Interpolation

The drive is given a target position in the **Drive Internal Interpolation** operating mode. When the operating mode is activated, the diagnostic message is one of the following:

- **A106 Drive Controlled (Internal) Interpolation / Encoder 1**
- **A107 Drive Controlled Interpolation / Encoder 2**
- **A108 Drive Controlled Interpolation / Encoder 1 / Lagless**
- **A109 Drive Controlled Interpolation / Encoder 2 / Lagless**

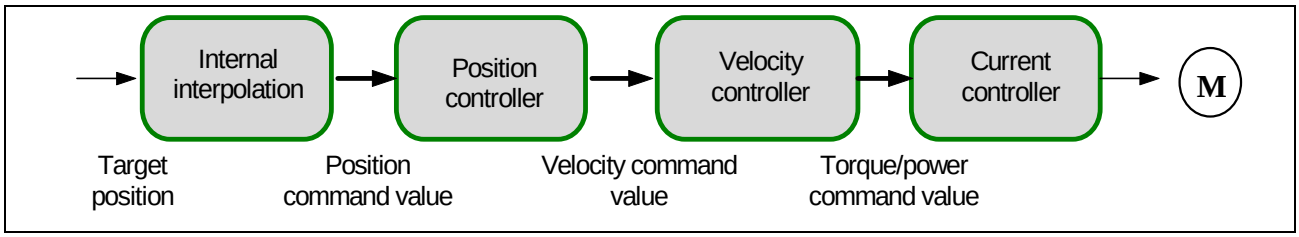


Fig. 6-11: Drive-internal interpolation diagram

Generator Function: Drive Internal Interpolation

The target value is entered in the parameter **S-0-0258, Target Position** . The drive generates the position command profile necessary to move to the target position using the following parameters as limits:

- **S-0-0259, Positioning velocity**
- **S-0-0260, Positioning acceleration**
- **S-0-0193, Positioning jerk**
- **S-0-0108, Feedrate override**

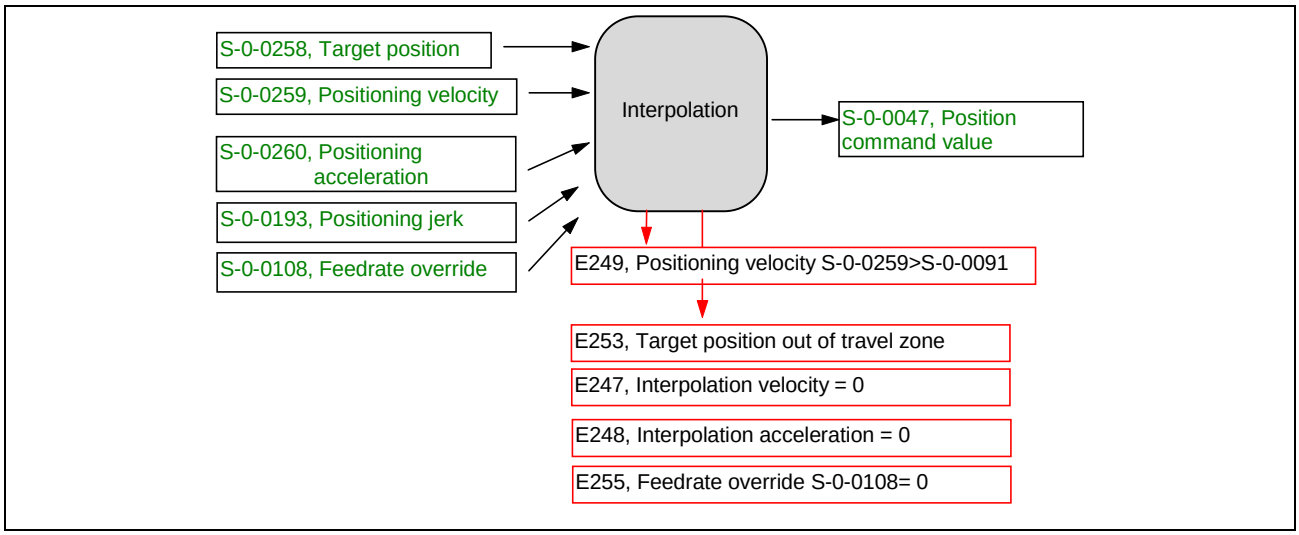


Fig. 6-12: Generator function drive internal generator function

See also position controller
See also velocity controller
See also current controller

Monitoring in mode: "Drive-internal interpolation"

The following checks are executed:

- If axis limit value monitoring is activated (Bit 4 of **S-0-0055, Position Polarity Parameter** is set) and the measurement system used for the operating mode has been homed, the parameter **S-0-0258, Target Position** is monitored for staying within the axis limit values. If these are exceeded, the warning **E253 Target position out of travel zone** is generated.

  The prescribed target position will not be accepted.

- If the prescribed positioning velocity **S-0-0259, Positioning velocity** exceeds the maximum allowable (**S-0-0091, Bipolar Velocity Limit Value**), the warning **E249 Positioning velocity S-0-0259 > S-0-0091** will be generated.

  The drive will move at the velocity **S-0-0091, Bipolar Velocity Limit Value** to the new target position.

- If the positioning velocity specified in **S-0-0259, Positioning velocity** equals 0, then warning **E247 Interpolation velocity = 0** is generated.

- If the factor affecting positioning velocity as set in **S-0-0108, Feedrate override** equals 0, then warning **E255 Feedrate-override S-0-0108 = 0** is generated.

- If the positioning acceleration specified in **S-0-0260, Positioning acceleration** equals 0, then warning **E248 Interpolation acceleration = 0** is generated.

Status messages during operating mode "Drive-internal interpolation"

In parameters S-0-0013, class 3 diagnostics and S-0-0182, manufacturers class 3 diagnostics there are the following status messages specifically for this mode:

- ***target position reached***, bit 12 of **S-0-0013, Class 3 Diagnostics** is 1, if it applies: internally effective command value equals **S-0-0258, Target Position**. This message then becomes 1, if the position command value generated by the drive-internal interpolator reaches the set target value.

- ***In target position***, bit 10 of **S-0-0182, Manufacturer Class 3 Diagnostics** is 1, if it applies: absolute difference between **S-0-0258, Target Position** and **S-0-0051/53, Position Feedback Value 1/3** smaller than **S-0-0057, Position window**. This message then becomes 1, if the relevant position feedback value is target positoin range +/- positioning window.

- ***IZP***, bit 6 of **S-0-0182, Manufacturer Class 3 Diagnostics** is a link of several status messages and is 1 if it applies: ***In target position*** = 1, i.e., absolute difference between **S-0-0258, Target Position** and **S-0-0051/53 Position feedback value 1/2** smaller than **S-0-0057, Position window** AND ***IN_POSITION*** = 1, i.e., amount of **S-0-0189, Following Error** smaller than **S-0-0057, Position window** AND ***Vist = 0***, amount of **S-0-0040, Velocity Feedback Value** smaller than **S-0-0124, Standstill window.**

The following profile explains how the status messages work:

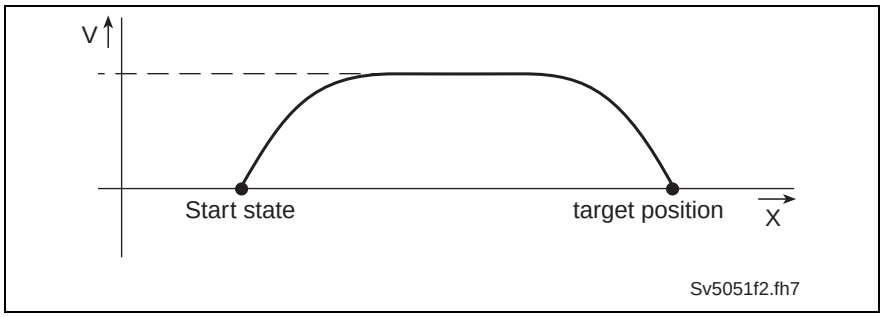


Fig. 6-13: Profile to explain how the interpolation status messsages work

In this example, the drive is on the start position, when the new target position is given.

The following time diagrams result:

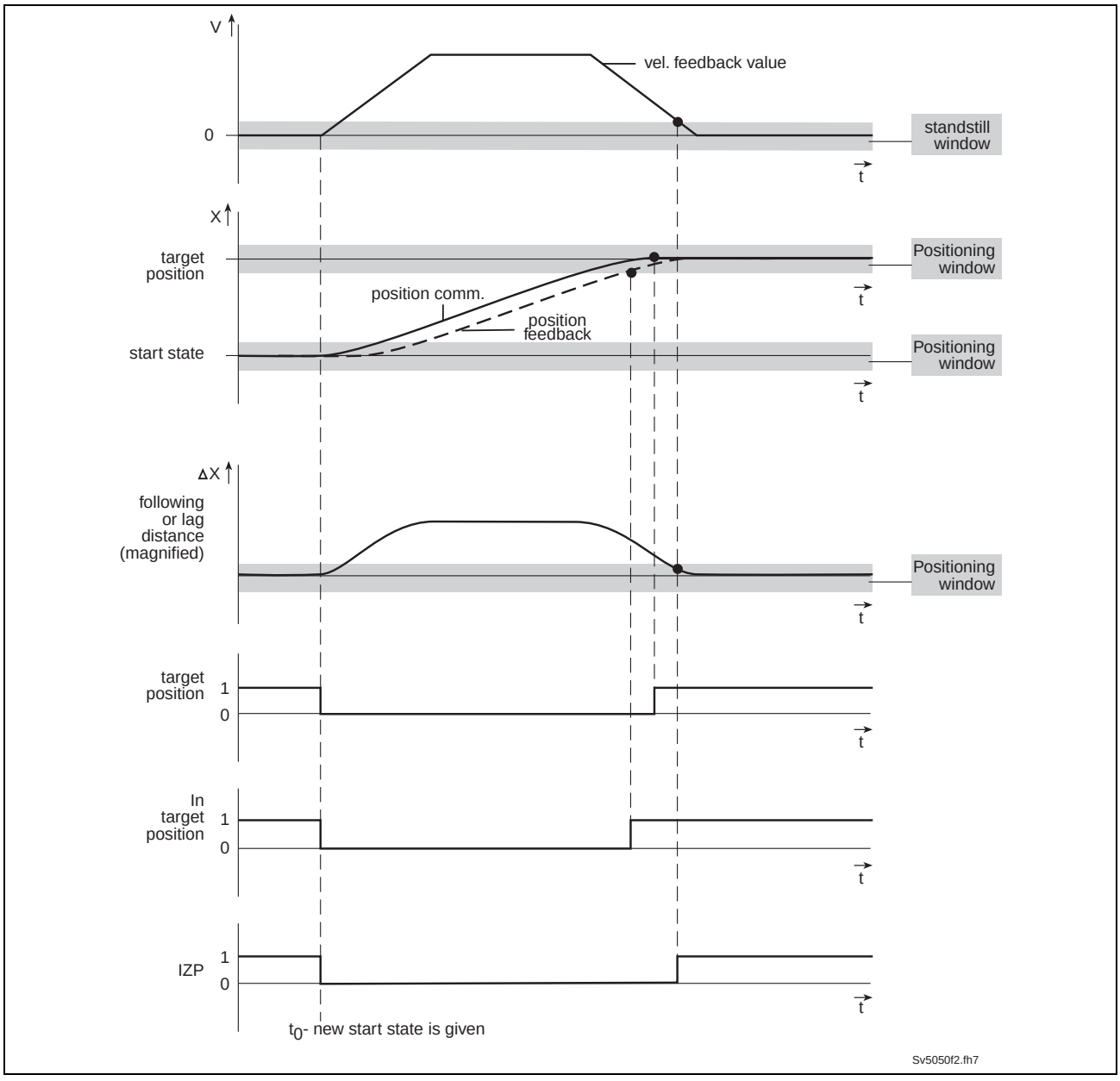


Fig. 6-14: Generating the status bit of the operating modes with drive-internal interpolation

Relative drive-internal interpolation

In operating mode **Relative drive-internal interpolation** the drive is given a path in parameter **S-0-0282, Travel distance.** If bit 0 of the acceptance parameter **S-0-0346, Setup flag for relative command values** toggels, then it is added to the target position in **S-0-0258, Target Position**. The drive generates the position command profile it needs to run to the target position while maintaining all marginal conditions in:

- **S-0-0259, Positioning velocity**
- **S-0-0260, Positioning acceleration**
- **S-0-0193, Positioning jerk**
- **S-0-0108, Feedrate override**

The diagnosis with activated operating mode is one of the following:

- **A146 Relative drive-internal interpolation, encoder1**
- **A147 Relative drive-internal interpolation, encoder2**
- **A148 Relative drive contr. interpolation, Enc. 1, lagless**
- **A149 Relative drive contr. interpolation, Enc. 2, lagless**

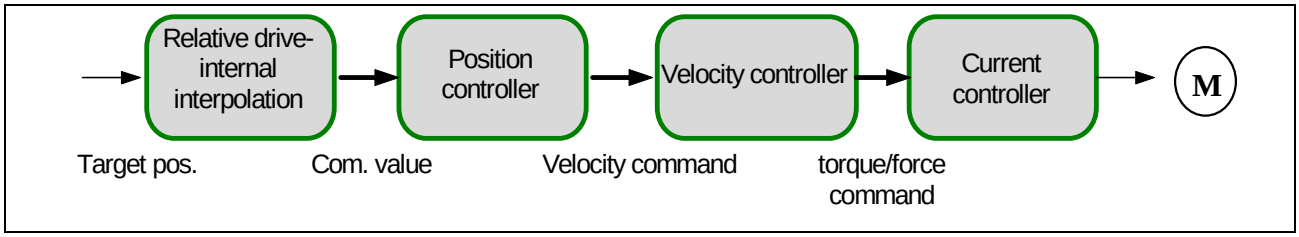


Fig. 6-15: Block diagram of relative drive-internal interpolation

Generator function: Relative drive-internal interpolation

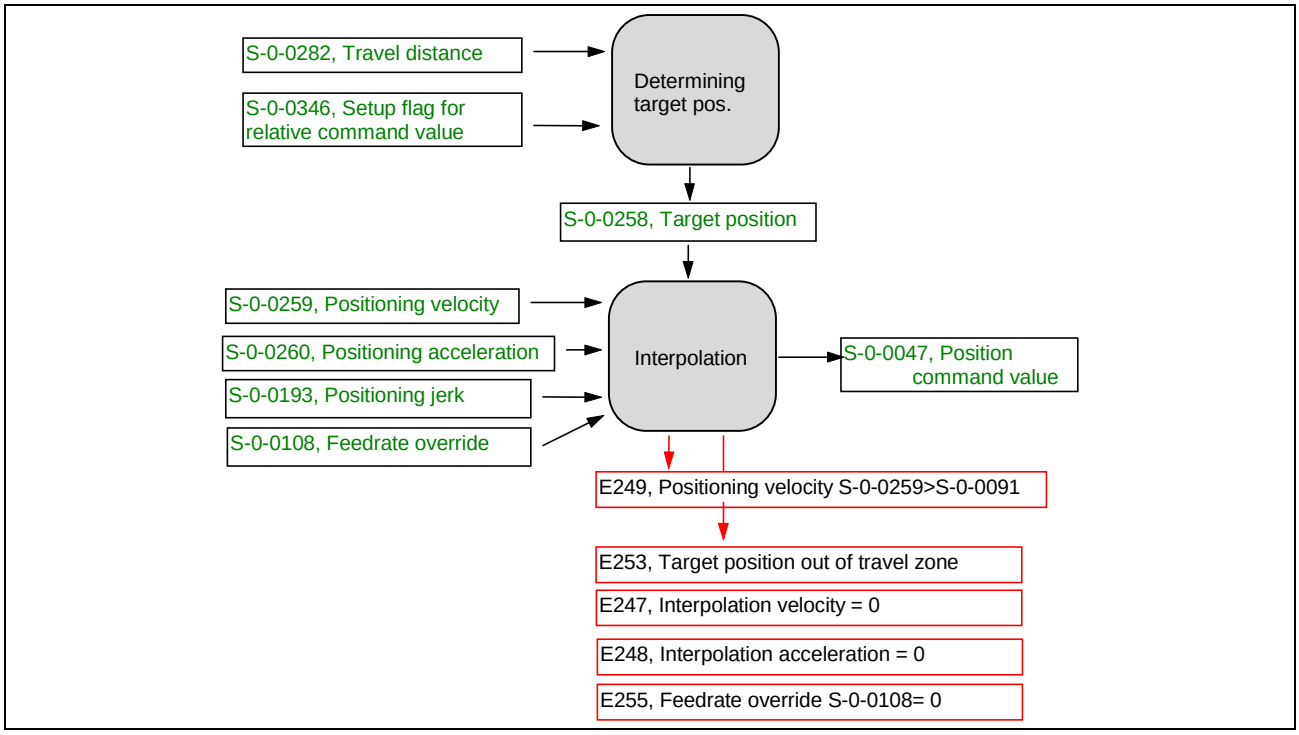


Fig. 6-16: Generator function relative drive-internal interpolation

See also position controller

See also velocity controller

See also current controller

Monitoring during mode "Relative drive-internal interpolation"

With activated mode, the following monitoring functions are performed:

- If position limit value monitor is active (bit 4 of **S-0-0055, Position Polarity Parameter** is set) and the measuring system used for the mode is in reference (**S-0-0403, Position feedback value status** = 1), then the sum of **S-0-0282, Travel distance** and **S-0-0258, Target Position** is monitored to ensure that it maintains the position limit value. Otherwise, the sum of the overtravelling of the drive-internally depicted numeric range (visible in the minimum and maximum input values of the travel distance parameter) is monitored. In either case, if the allowable range is exceeded, the warning **E253 Target position out of travel zone** is generated. The set travel path is not accepted if the acceptance toggles.
- If the positioning velocity set in **S-0-0259, Positioning velocity** exceeds maximum allowable velocity set in **S-0-0091, Bipolar Velocity Limit Value** then the warning **E249 Positioning velocity S-0-0259 > S-0-0091** is generated. The set travel path is not accepted if the acceptance toggels.
- If the positioning velocity set in **S-0-0259, Positioning velocity** equals 0, then warning **E247 Interpolation velocity = 0** is generated.

- If the factor affecting the positioning velocity in **S-0-0108, Feedrate override** equals 0, then warning **E255 Feedrate-override S-0-0108 = 0** is generated.
- If the positioning acceleratiion set in **S-0-0260, Positioning acceleration** equals 0, then the warning **E248 Interpolation acceleration = 0** is generated.

Status messages during operating mode "Relative drive-internal interpolation"

see functional description:

Status messages during operating mode Drive-internal interpolation

6.3 Setting the Operating Mode Parameters

With the help of the parameters:

- **S-0-0032, Primary Mode of Operation**
- **S-0-0033, Secondary Operating Mode 1**
- **S-0-0034, Secondary Operating Mode 2**
- **S-0-0035, Secondary Operating Mode 3**

4 different operating modes can be preselected simultaneously.

Bits 8 and 9 of the master control word define which of the four modes will be operative. The operation can be switched between the 4 operating modes.

The operating modes can be preselected in parameters S-0-0032..35. The operating modes can be selected by entering a bit code.

Certain positions are fixed in this bit list.

In bit 3, you can choose between working with position control with or without lag.

The following applies:

Bit 3 = 0 position control with lag

Bit 3 = 1 position control without lag

Bit code:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-internal interpolation, encoder 1
0000,0000,0001,x100	Drive-internal interpolation, encoder 2
0000,0010,0001,x011	Relative drive-internal interpolation, encoder 1
0000,0010,0001,x100	Relative drive-internal interpolation, encoder 2

Fig. 6-17: Setting the Operating Mode Parameters

6.4 Determining the Active Operating Mode

Bits 8 and 9 in the master control word determine which of the 4 preselected operating modes will be active.

Bit 8 and 9 in the master control word:	Active operating mode:
0 0	Primary mode of operation
0 1	Secondary mode of operation 1
1 0	Secondary mode of operation 2
1 1	Secondary mode of operation 3

Fig. 6-18: Determining the Active Operating Mode

If 0 is entered in the operating mode parameters and the operating mode is activated, then the error **F207 Switching to uninitialized operation mode** will be generated.

Notes

7 Basic Drive Functions

7.1 Physical Values Display Format

Data exchange between the controller and the primary control system or user interface occurs by reading and writing controller parameters. Information about the unit and the number of decimal places (see also parameter) is necessary for interpreting the operating data of a parameter. The LSB value of the operating data is produced from these data. The following illustration shows this with an example.

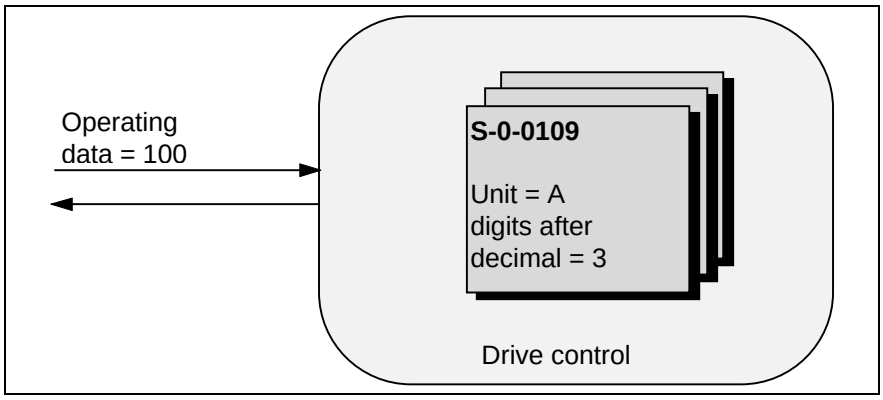


Fig. 7-1: Example for interpreting operating data in the drive

The combination of unit and number of decimal places is expressed with the term scaling.

The operating data of the parameter S-0-0109 is given the value 100 in the picture shown above. When combined, the unit A(mps) that belongs to this parameter and the number of decimal places produce the physical value **0.100 A**.

Each parameter can therefore be called up with a unit and the number of decimal places. The combination of these two criteria is united under the term **scaling**. When interpreting operating data, these must always be included in the analysis. Units and number of decimal places are listed along with all other parameter attributes in Supplement A, Parameter Description, for each parameter.

Adjustable Scaling for Position, Velocity, and Acceleration Data

The LSB value of position, velocity, and acceleration data can be set by adjustable scaling.

The parameter scaling for

- position,
- velocity and
- acceleration data

can be adjusted. It can be set by the user with scaling parameters. It enables

1. the value of this data to be made compatible for exchange between control system and control drive, or, in other words, the data can be exchanged in the control system's internal format. The control system will not need to convert this data.

2. this data to conform to machine kinematics. Linear movements can be described with linear units, for example, and rotary movements can be described with rotary units.

It is possible to select between linear and rotary scaling, and preferred and parameter scaling, as well as between motor and load reference.

Linear - Rotary Scaling

Adjustable scaling allows either linear or rotary scaling to be selected. Linear motors normally use a linear scale. Rotary motors use either a rotary or linear scale if their rotary movement is converted into a linear movement (with a ball roll spindle, for example).

Preferred Scaling - Parameter Scaling

Adjustable scaling allows either preferred scaling or parameter scaling to be selected. If preferred scaling is selected, the appropriate scaling factor parameters and scaling exponent parameters in **S-0-0128, C200 Communication phase 4 transition check** are overwritten with preferred values. This sets a pre-defined scaling. The scaling factor parameter and the scaling exponent parameter are not entered. The concrete preferred scaling adjusts itself to the selection of linear or rotary scaling.

The following preferred scalings are available:

Physical Value:	Rotary Preferred Scaling:	Linear Preferred Scaling (mm):	Linear Preferred Scaling (Inch):
Position data	0.0001 Degrees	0.0001 mm	0.001 Inches
Velocity Data	0.0001 RPM, or 10^-6 Rev/s	10^ 6 m/min	10^-5 in/min
Acceleration Data	0.001 rad/s²	10^-6 m/s²	--

Fig. 7-2: Preferred scaling - parameter scaling

Motor Reference - Load Reference

Either motor reference or load reference can be selected when adjusting the scaling.

With rotary load reference, the scaled data from the motor format is converted to the transmission output format with the transmission ratio **S-0-0122, Output revolutions of load gear** / **S-0-0121, Input revolutions of load gear**.

With linear load reference, the scaled data from the motor format is converted to feed constant spindle format with the transmission ratio **S-0-0122, Output revolutions of load gear** / **S-0-0121, Input revolutions of load gear** and the feed constant **S-0-0123, Feed constant**.

The following restrictions apply in relationship to the motor type being used :

- Rotary motor reference cannot be set with linear motors.
- Linear motor reference cannot be set with rotary motors.

Display Format of Position Data

The scaling of drive controller position data is adjustable. This is done with the parameters

- **S-0-0076, Position Data Scaling Type**
- **S-0-0077, Linear Position Data Scaling Factor**
- **S-0-0078, Linear Position Data Scaling Exponent**
- **S-0-0079, Rotational position resolution**

This differentiates between linear and rotary scaling. **S-0-0079, Rotational position resolution** sets the rotary position scaling. **S-0-0077, Linear Position Data Scaling Factor** and **S-0-0078, Linear Position Data Scaling Exponent** set the linear position scaling.

The scaling type is set in **S-0-0076, Position Data Scaling Type**.

The parameter is defined as follows:

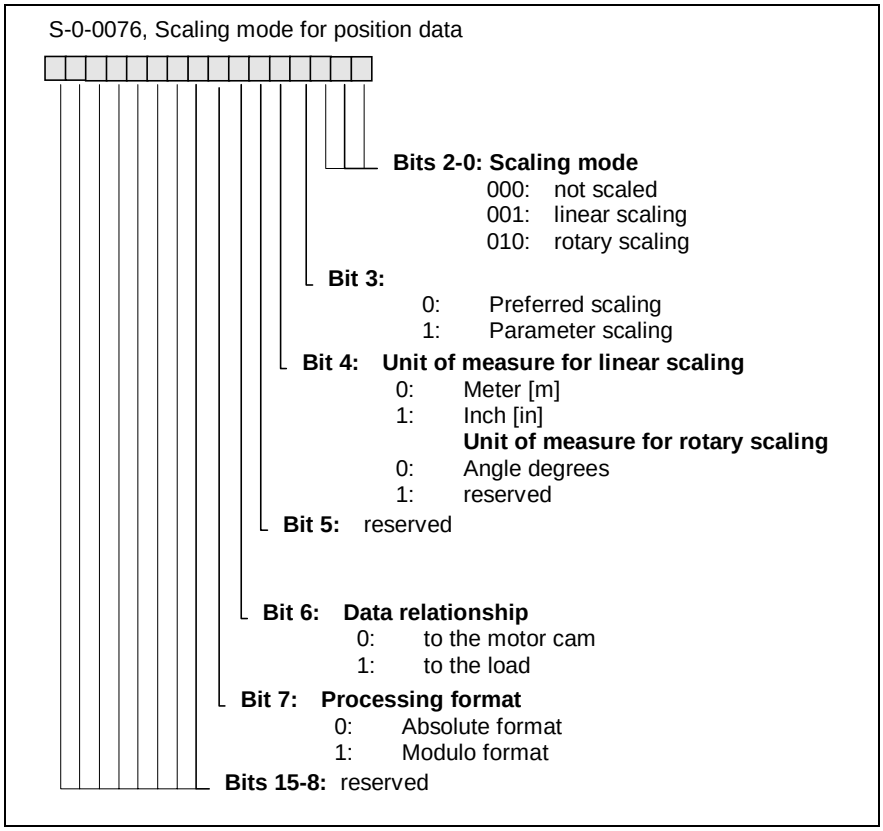


Fig. 7-3: Parameter S-0-0076

The actual scaling type is set in bit 0..2.

In Bit 3, either preferred scaling (parameters **S-0-0077, Linear Position Data Scaling Factor**, **S-0-0078, Linear Position Data Scaling Exponent** or **S-0-0079, Rotational position resolution** are pre-defined and cannot be changed) or parameter scaling (scaling is determined by entering this parameter) can be selected. (see Preferred Scaling - Parameter Scaling)

Bit 4 indicates the measurement unit. With linear scaling, either mm or inch can be selected here.

Bit 6 defines motor or load reference.

Bit 7 determines the processing format (see Modulo feature)

The scaling type setting is checked for plausibility in **S-0-0128, C200 Communication phase 4 transition check**, and the command error message **C213 Position Data Scaling Error** is generated, if necessary.

Velocity Data Display Format

The scaling of the drive controller's velocity data is adjustable.

This is done with the parameters

- **S-0-0044, Velocity data scaling type**
- **S-0-0045, Velocity data scaling factor**
- **S-0-0046, Velocity data scaling exponent**

The scaling type is set in **S-0-0044, Velocity data scaling type**. The parameter is defined as follows:

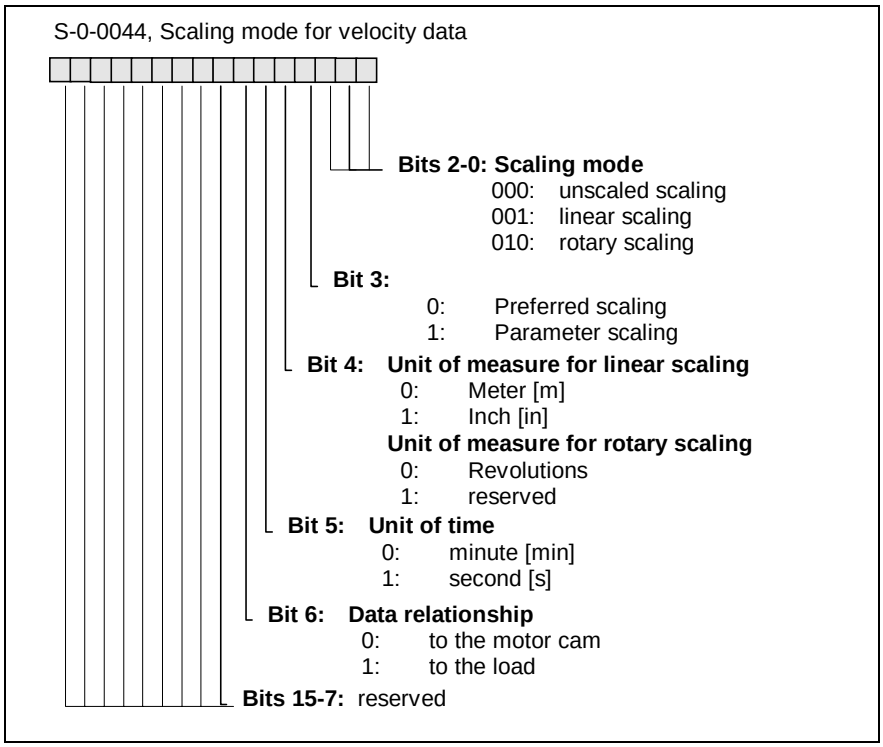


Fig. 7-4: Parameter S-0-0044

The actual scaling type is set in bit 0..2.

In bit 3, either preferred scaling (parameters **S-0-0045, Velocity data scaling factor** and **S-0-0046, Velocity data scaling exponent** are pre-defined and cannot be changed) or parameter scaling (scaling is determined by entering this parameter) can be selected. (see Preferred Scaling - Parameter Scaling)

Bit 4 indicates the measurement unit. With linear scaling, either m or inch can be selected here.

Bit 5 specifies the unit of time, either minutes or seconds.

Bit 6 defines motor or load reference.

The scaling type setting is checked for plausibility in **S-0-0128, C200 Communication phase 4 transition check,** and the command error message **C214 Velocity Data Scaling Error** is generated, if necessary.

Acceleration Data Display Format

The scaling of the drive controller's acceleration data is adjustable.

This is done with the parameters

- **S-0-0160, Acceleration data scaling type**
- **S-0-0161, Acceleration data scaling factor**
- **S-0-0162, Acceleration data scaling exponent**

The scaling type is set in **S-0-0160, Acceleration data scaling type**. The parameter is defined as follows:

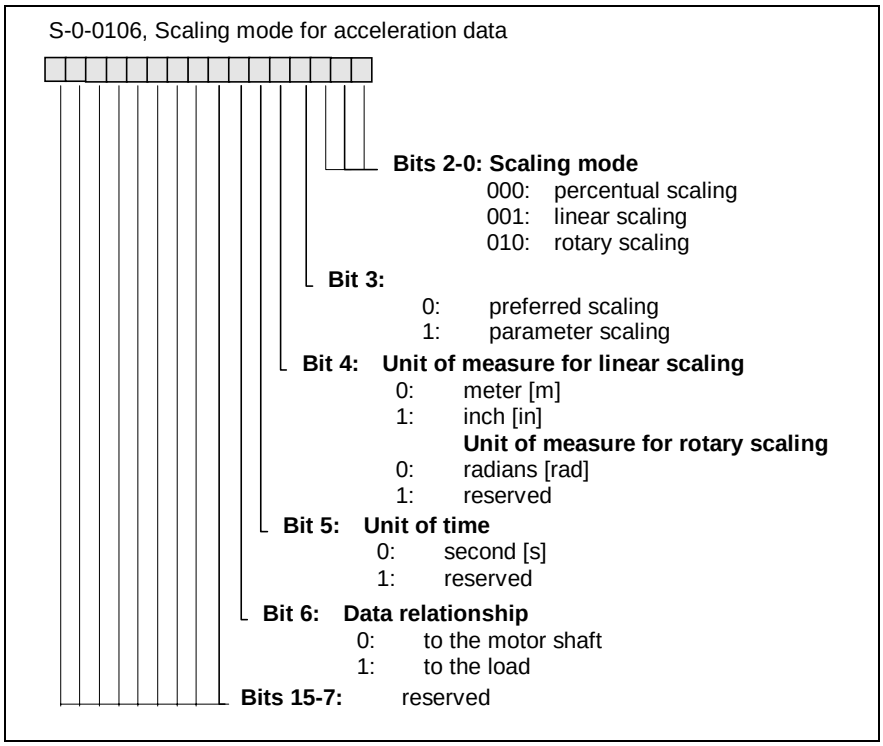


Fig. 7-5: Parameter S-0-0160

The actual scaling type is set in bit 0..2.

Either preferred scaling (parameters **S-0-0161, Acceleration data scaling factor** and **S-0-0162, Acceleration data scaling exponent** are pre-defined and cannot be changed) or parameter scaling (scaling is determined by entering this parameter) can be selected in bit 3. (see Preferred Scaling - Parameter Scaling)

Bit 6 defines motor or load reference.

The scaling type setting is checked for plausibility in **S-0-0128, C200 Communication phase 4 transition check,** and the command error message **C215 Acceleration Data Scaling Error** is generated, if necessary.

Command Polarities and Actual Value Polarities

The drive-internal polarities of position, velocity, torque/force and actual value are fixed. The following applies:

Motor type:	Drive internal positive direction definition:
Rotary motors	Clockwise rotation facing the motor shaft
Linear motors	Move in the direction of the frontal area of the power cable on the primary component

Fig. 7-6: Drive internal positive direction definition

The positive direction is specified by the manufacturer for MDD-, MKD and MKE motors. Asynchronous motors and linear synchronous motors should be set in this direction during installation. (see "other motor encoder characteristics"). The command polarity and actual value polarity of the drive is thereby fixed.

If the drive's definition of the positive direction does not conform to the requirements of the machine, the parameters

- **S-0-0055, Position Polarity Parameter**
- **S-0-0043, Velocity polarity parameter**
- **S-0-0085, Torque/Force polarity parameter**

can invert the command and actual value polarities.

Note: If the polarity needs to be changed, all 3 parameters should always be inverted at the same time, so that the polarities of the position, velocity, and torque/force have the same sign.

The following illustration shows the operating characteristics of the polarity parameters.

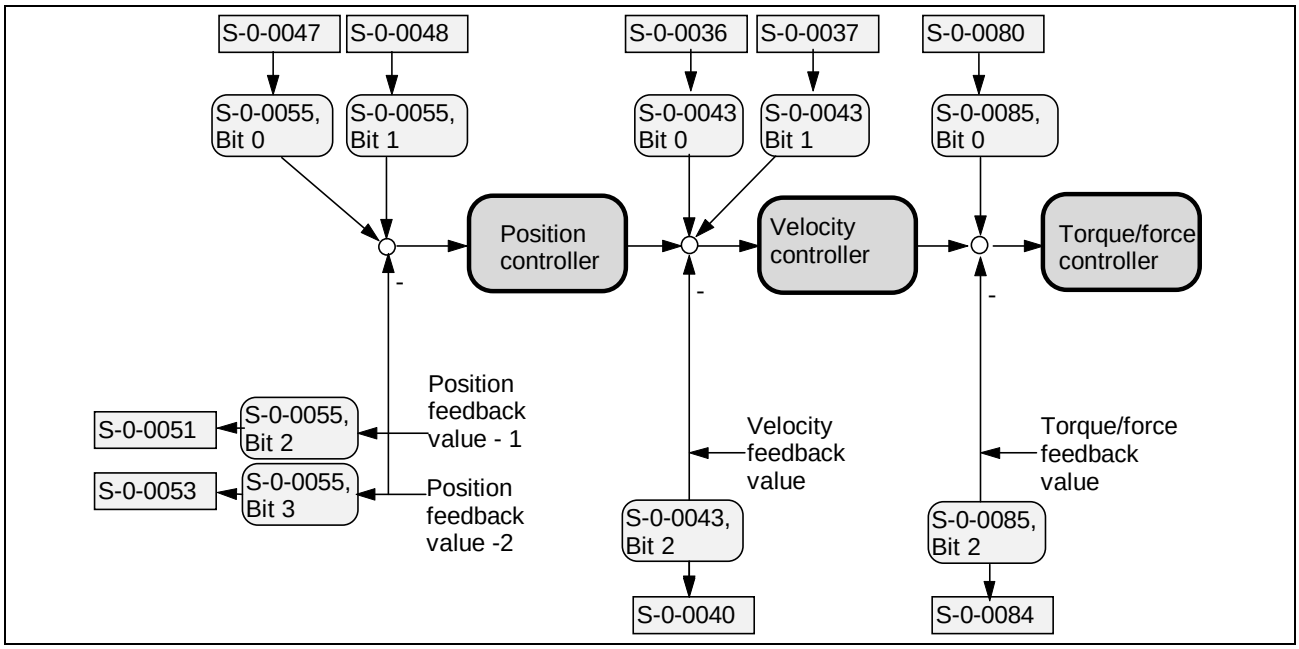


Fig. 7-7: Polarity parameter operating characteristics

The polarity parameters affect only the display values, not the control feedback values.

The drive software only allows all bits within a polarity parameter to be inverted. If bit 0 is inverted, all other bits of the parameter are also inverted. This prevents setting positive feedback in the regulator loops because of faulty command and feedback value polarities.

Mechanical Transmission Elements

Mechanical transmission elements are gearboxes and feed mechanisms between the motor shaft and the load. Entering these data is necessary for the load to convert the position, velocity, and acceleration physical values, if these are scaled for the load. (See also "Adjustable Scaling for Position, Velocity, and Acceleration Data".) To see if this parameter has been entered correctly, move the shaft and compare the path followed with the position feedback value and the path actually taken.

Transmission Ratio

The transmission ratio can be determined with the parameters

- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**

The ratio between transmission input and transmission output is parameterized here.

Example:

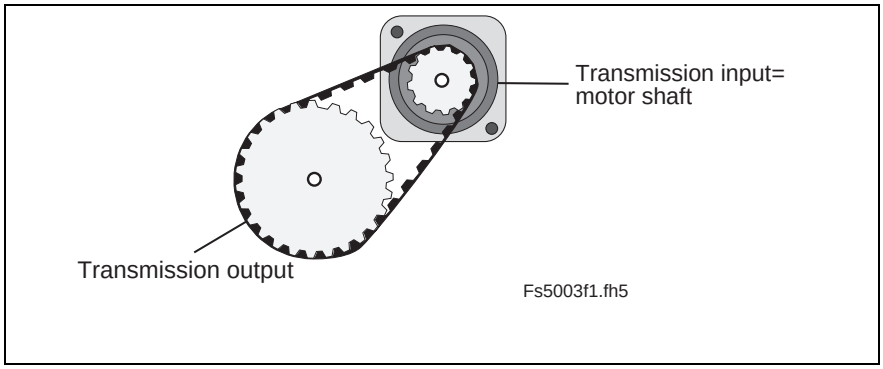


Fig. 7-8: Transmission ratio parameterization

In the illustration above, 5 transmission input revolutions (= motor revolutions) were equivalent to 2 transmission output revolutions. The proper parameterization for this would be :

S-0-0121, Input revolutions of load gear = 5

S-0-0122, Output revolutions of load gear = 2

Feed Constant

The feed constant defines which linear path the load should follow per transmission output revolution. It is specified in the parameter **S-0-0123, Feed constant**.

The value programmed here is used along with the transmission ratio for converting the position, velocity, and acceleration data from motor reference to load reference.

Example:

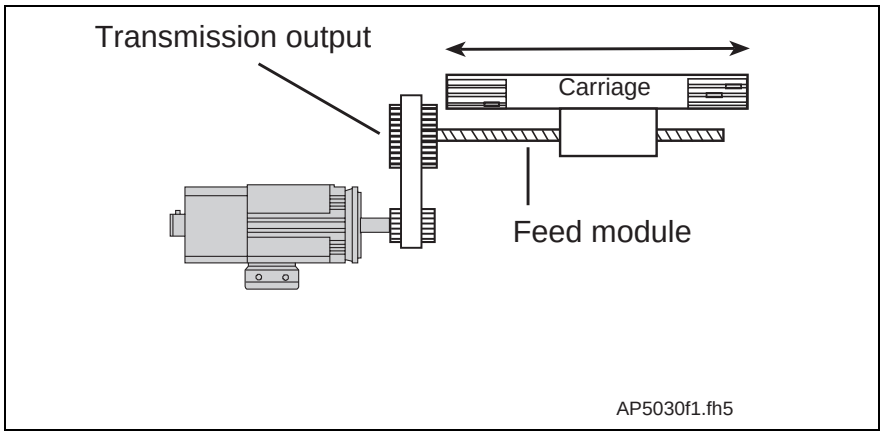


Fig. 7-9: Feed constant parameterization

In the illustration above, the feed module would cover 10 mm per transmission output revolution. The proper parameterization for this would be :

S-0-0123, Feed Constant = 10 mm/Rev

Modulo Feature

When the modulo function is activated, all position data within the modulo range are displayed.

When the modulo function is activated, all position data are displayed in the range 0..(modulo value-1). This makes it possible to have shafts continuously moving in one direction without an overflow in the position data.

The modulo value is set with the parameter **S-0-0103, Modulo Value**.

The modulo function is activated by the parameter **S-0-0076, Position Data Scaling Type**.

(See also "Display Format of Position Data".)

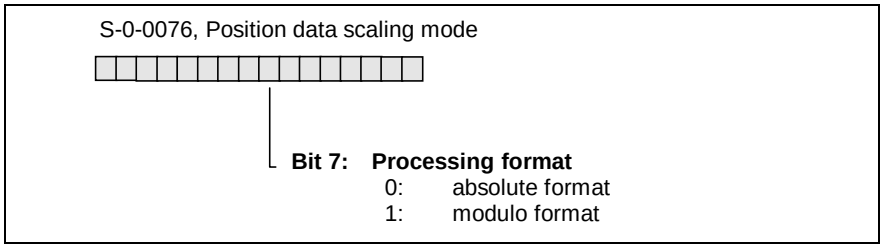


Fig. 7-10: Setting absolute format - modulo format

Note: Modulo processing of position data according to is only allowed with rotary motor types. This is checked in **S-0-0128, C200 Communication phase 4 transition check** and acknowledged by the command error **C213 Position Data Scaling Error** if necessary.

The following illustration elucidates the difference in displaying the position data in absolute format and modulo format:

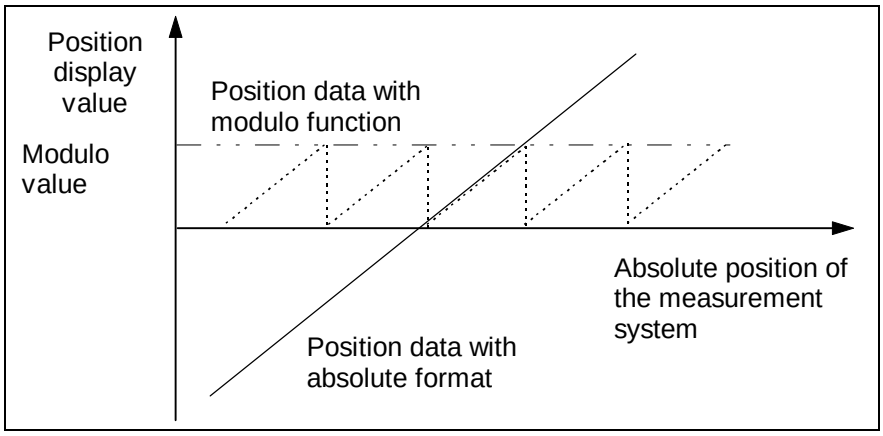

Position display value
Position data with modulo function
Modulo value
Absolute position of the measurement system
Position data with absolute format

Fig. 7-11: Display value of positions in absolute format and modulo format

Modulo Processing-Limiting Conditions

If modulo processing of position data is selected, in connection with

- the active operating mode and
- the selected position scaling

the following limiting conditions for error-free processing of the position data must be observed. Compliance with the limiting conditions is checked in **S-0-0128, C200 Communication phase 4 transition check**, and the command is terminated with the error **C227 Modulo Range Error** if necessary.

The limiting conditions for error-free modulo value processing are as follows:

- The modulo range **S-0-0103, Modulo Value** may not be greater than half the maximum travel range. The maximum travel range depends on the motor feedback being used (see also "Drive-internal format of position data").
- If rotary or linear position scaling with load reference and without angle synchronization is used as the operating mode, the product of **S-0-0103, Modulo Value, S-0-0116, Resolution of motor feedback** and **S-0-0121, Input revolutions of load gear** must be smaller than 2^63.

- If rotary position scaling with load reference and angle synchronization is used as the operating mode, the product of **S-0-0237, Slave drive 1 revs.**, **S-0-0116, Resolution of motor feedback** and **S-0-0121, Input revolutions of load gear** must be smaller than 2^63.
- If the angle synchronization operating mode is used, linear position scaling may not be selected.

If, in addition to this, an external measurement system is used, the additional requirements are:

- If rotary position scaling with motor reference and no angle synchronization operating mode is used, the product of **S-0-0103, Modulo Value**, **S-0-0117**, **Resolution of external feedback** and **S-0-0122, Output revolutions of load gear** must be smaller than 2^63.
- If rotary position scaling with motor reference and angle synchronization operating mode is used, the product of **S-0-0237, Slave drive 1 revs.**, **S-0-0117**, **Resolution of external feedback** and **S-0-0122, Output revolutions of load gear** must be smaller than 2^63.

Processing Command Values in Modulo Format, Shortest Path - Direction Selection

The interpretation of position command values such as **S-0-0047, Position Command Value** and **S-0-0258, Target Position** when the modulo function has been activated is dependent on the selected mode.

The following possibilities exist:

- Shortest Path
- Positive Direction
- Negative Direction

The parameter **S-0-0393, Command value mode for modulo format** can be used to set the mode. This parameter is effective only if modulo format has been activated in **S-0-0076, Position Data Scaling Type**.

The following settings can be entered:

S-0-0393:	Meaning:
0	Shortest Path
1	Positive Direction
2	Negative Direction

Fig. 7-12: Selecting modulo mode

Modulo Mode "Shortest Path"

The next command value is reached with the shortest path. If the difference between two successive command values is greater than half of the modulo value, the drive moves toward the command value in the opposite direction.

Modulo Mode "Positive Direction"

The command value is always approached in a positive direction, regardless of whether or not the difference between two successive command values is greater than half of the modulo value.

Modulo Mode "Negative Direction"

The command value is always approached in a negative direction, regardless of whether or not the difference between two successive command values is greater than half of the modulo value.

7.2 Setting the Measurement System

The following feedback systems can be evaluated with the DIAX series of controllers:

- Digital servo feedback
- Resolver
- Incremental encoder with sine signals
- Incremental encoder with square-wave signals
- Indramat gearwheel-type encoder
- Measurement system with SSI interface
- Measurement system with EnDat interface
- Gearwheel encoder with 1Vpp signals
- Resolver without feedback memory
- Resolver with one pole pair without feedback data memory plus incremental encoder with sine signals.

The drive is connected to an encoder interface (standard), either a digital servo feedback or a resolver. Additional plug-in cards are available for evaluating different types of encoders. Specifically, the following measurement systems can be implemented with the corresponding module shown below.

Feedback System:	Module:	Value in P-0-0074/75
Digital servo feedback or resolver	Standard	1
Incremental feedback with sine signal from the Heidenhain company, either µA or 1V signals selectable	DLF01.1U	2
Indramat gearwheel encoder	DZF02.1U	3
Digital servo feedback	DFF01.1U	4
Incremental encoder with square-wave signals from the Heidenhain company	DEF01.1U	5

Incremental encoder with square-wave signals from the Heidenhain company	DEF02.1U	6
Encoder with SSI interface (only 4096 incr./rev.)	DAG01.2U	7
Encoder with EnDat interface	DAG01.2U	8
Gearwheel encoder with 1Vpp signals	DZF03.1U	9
Resolver without feedback memory	Standard	10
Resolver without feedback memory plus incremental encoder with sine signals	Standard + DLF01.1U	11

Fig. 7-13: Feedback systems > necessary plug-in modules

Each module is assigned a number that determines the feedback interface. The module number is entered into the following parameters:

- **P-0-0074, Interface Feedback 1**
- **P-0-0075, Interface Feedback 2, external**

(See also Possible error messages when reading and writing the operating data).

This check is also made in the command **S-0-0128, C200 Communication phase 4 transition check**. The command error **C203 Parameter Conversion Error (->S-0-0022)** is generated there.

Displaying the position feedback values of the individual measurement systems is done with the parameters

- **S-0-0051, Position Feedback Value 1 (Motor Feedback)**
- **S-0-0053, Position Feedback Value 2 (Ext. Feedback)**

Setting the absolute relationship of the position feedback values-1/2 to the machine zero point is done with the commands

- **S-0-0148, C600 Drive controlled homing procedure command, or**
- **P-0-0012, C300 Command 'Set absolute Measurement'**

Limiting Conditions for Encoder Evaluation

The following limitations exist:

- The DLF, DZF, DEF 1 modules may not be simultaneously operated within a controller.

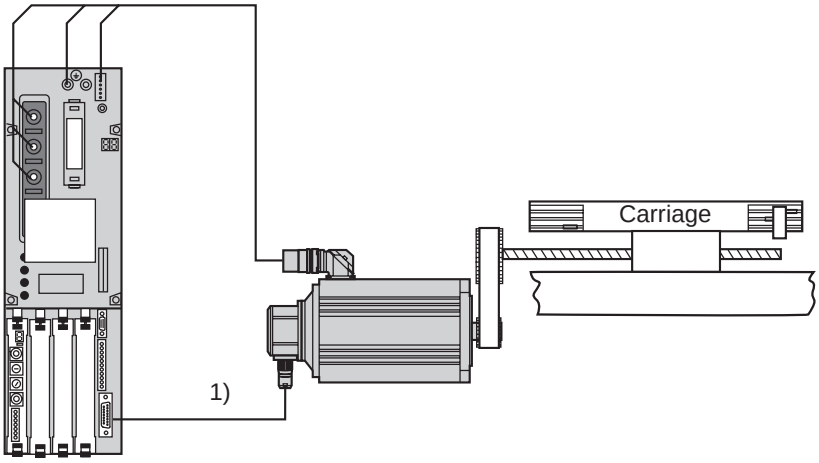
  ⇒ **Danger of Damage!**

  The combination of DLF and DZF is not possible. The DEF 2 module can be used to operate an incremental feedback with square-wave signals while a DLF or DZF is also being used.

- The DAG 1.2 contains a switch that allows the interface to be changed to an SSI interface (7) or an EnDat interface (8). Make sure that the switch is set correctly.
- If attempting to evaluate an external encoder with an SSI interface, only measurement systems with a resolution of 4096 Incr./Rev. and absolute resolution can be used. If the position loop is closed via this measurement system, only a limited dynamic can be achieved because of the serial transmission from the feedback to the controller.
- Only the standard module, DLF, DZF, or DAG 1.2 can be used to evaluate a motor encoder.
- It is not possible to use a resolver as an external measurement system.

Motor Encoder

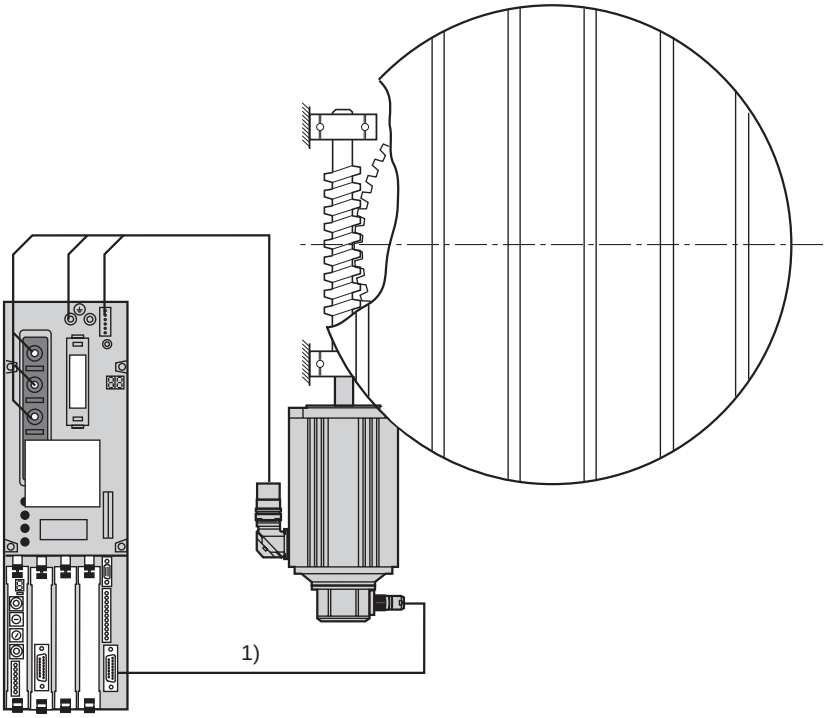
The measurement system which is directly coupled with the motor shaft without a gearbox between is called the motor encoder. As the motor is usually coupled to the load with a mechanical gearbox and probably a feed unit, we call this also an indirect distance measurement. If a further measurement system is attached directly to the load, we call this a direct distance measuring (see "External Encoder"). Hereafter, we show typical applications of indirect distance measurements.



1) Indirect position actual feedback acquisition via the drive's internal position measuring system

Ap5033f1.fh7

Fig. 7-14: Application: Motor encoder with linear servo axis



1) Indirect position actual feedback acquisition via the drive's internal position measuring system

Ap5034f1.fh5

Fig. 7-15: Application: Motor encoder with rotary servo axis

The following parameters

- **P-0-0074, Interface Feedback 1**
- **S-0-0116, Resolution of motor feedback**
- **S-0-0277, Position feedback 1 type parameter**

are used to parameterize the motor feedback. These specify the interface number to which the measurement system is connected, the motor feedback resolution, as well as the direction of movement, etc. The parameter **S-0-0051, Position Feedback Value 1 (Motor Feedback)** displays the position of the motor feedback.

The absolute Measurement relative to the machine zero point is set with

- **S-0-0148, C600 Drive controlled homing procedure command**

or, for absolute encoders,

- **P-0-0012, C300 Command 'Set absolute Measurement'**

Determining the Feedback Interface of the Motor Feedback

Determining the encoder interface of the motor encoder is done with the parameter **P-0-0074, Interface Feedback 1**. Enter the number of the module to which the motor feedback is connected in the parameter. The motor encoder interface in P-0-0074 is automatically set with certain types of motors.

(See also "Characteristics of the Different Motor Types".)

The following measurement systems and modules may be used with motors with motor encoder interfaces that can be parameterized.

Feedback System	Module	Number	for Synchronous motors	for Asynchronous motors
None (only with rotary asynchronous motors)	--	0	no	yes
Digital servo feed back or resolver	Standard	1	yes	yes
Incremental encoder with sine signals from the Heidenhain company, with either µA or 1V signals	DLF01.1M	2	no	yes
Indramat gear-type encoder	DZF02.1M	3	no	yes
Incremental encoder with square-wave signals from the Heidenhain company	DEF01.1M	5	no	yes
Encoder with EnDat interface from the Heidenhain company	DAG01.2M	8	yes	yes
Gearwheel with 1Vpp signals	DZF03.1M	9	no	yes
Resolver without feedback data memory	Standard	10	yes	no
Resolver without feedback data memory plus incremental encoder with sine signals	Standard + DLF01.1M	11	yes	no

Abb. 7-16: Determining the encoder interface for the motor encoder

Note: The motor encoder is only then unnecessary if you work with a loadside motor encoder. This is only possible with rotary asynchronous motors (**P-0-4014, Motor Type** = 2 or 6). In this case, the external encoder is the only control encoder (see also "External Encoder").

Motor Encoder Resolution

The motor encoder resolution is parameterized in the parameter **S-0-0116, Resolution of motor feedback**. Enter the graduation scale of the motor feedback. If using a measurement system with intrinsic feedback data storage, the resolution will be taken from this and does not need to be entered. Measurement systems with feedback storage are available if

- Standard (1) or
- DAG 1.2 (8)

is used as the motor encoder interface.

Depending on whether a rotary or linear motor is used, the units and the number of decimal places are changed via **S-0-0116, Resolution of motor feedback**.

(see also Linear-Rotational)

Other Motor Encoder Characteristics

To parameterize the other motor encoder characteristics, such as

- Direction of movement not-inverted/inverted
- Distance-coded reference mark yes/no
- Rotary / linear measurement system
- Absolute evaluation possible
- Absolute evaluation activated

use **S-0-0277, Position feedback 1 type parameter**. The structure of this parameter is as follows:

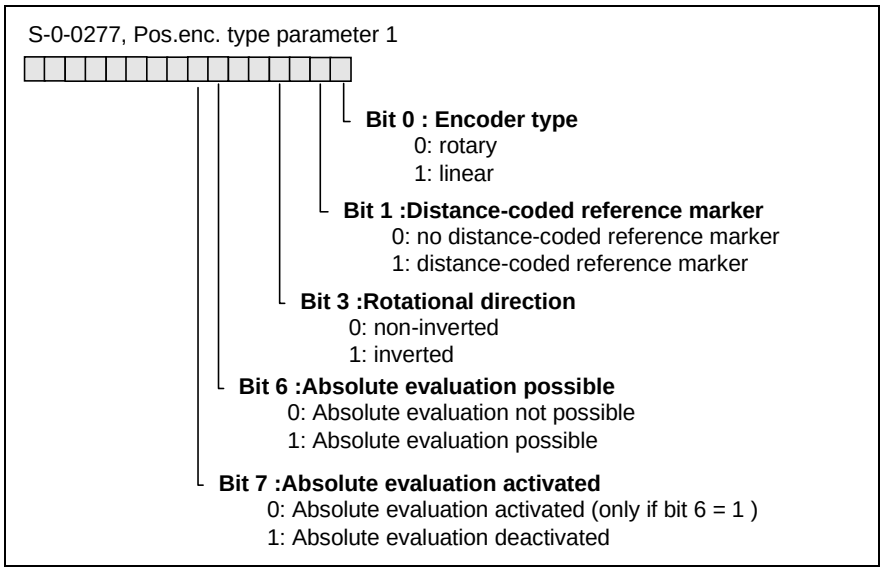

S-0-0277, Pos.enc. type parameter 1
Bit 0 : Encoder type
0: rotary
1: linear
Bit 1 :Distance-coded reference marker
0: no distance-coded reference marker
1: distance-coded reference marker
Bit 3 :Rotational direction
0: non-inverted
1: inverted
Bit 6 :Absolute evaluation possible
0: Absolute evaluation not possible
1: Absolute evaluation possible
Bit 7 :Absolute evaluation activated
0: Absolute evaluation activated (only if bit 6 = 1)
1: Absolute evaluation deactivated

Fig. 7-17: Parameter S-0-0277

The bits in the position encoder type parameter are partially set or deleted by the drive itself.

There are following dependencies:

- If the connected motor has a motor feedback memory (MDD, MKD or MKE), then bits 0, 1 and 3 are cleared.
- If the connected motor is a linear motor, then bit 0 is set to 1.
- Depending on the absolute encoder range and the maximum travel range or modulo value, bit 6 is either set or cleared.

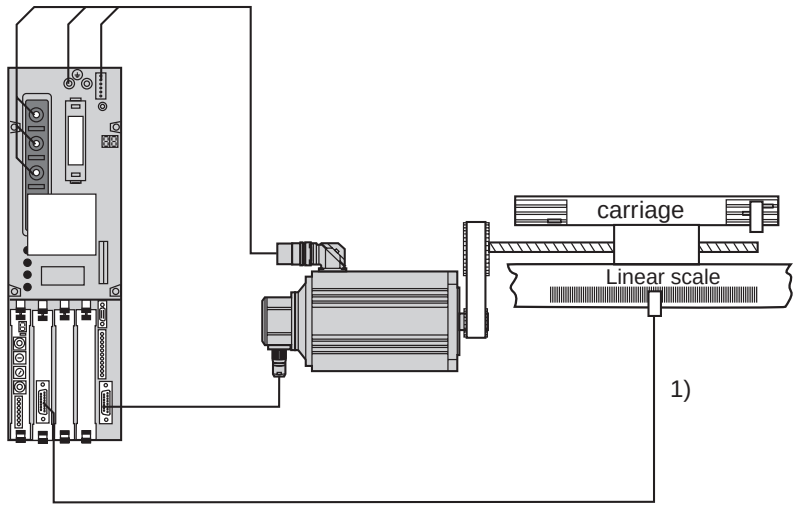
(See also "Other Settings for Absolute Measurement Systems".)

External encoder

The control with external encoder facilitates a higher contour precision of the machined workpieces resp. a higher positioning accuracy. With setting the operation mode, you can determine that the position control in the drive is done with the position feedback of the external encoder. Additionally, the velocity control can be completely or partially done with the velocity feedback signal of this measurement system.

(See also "Operating Modes" and "Setting the Velocity Mix Factor".)

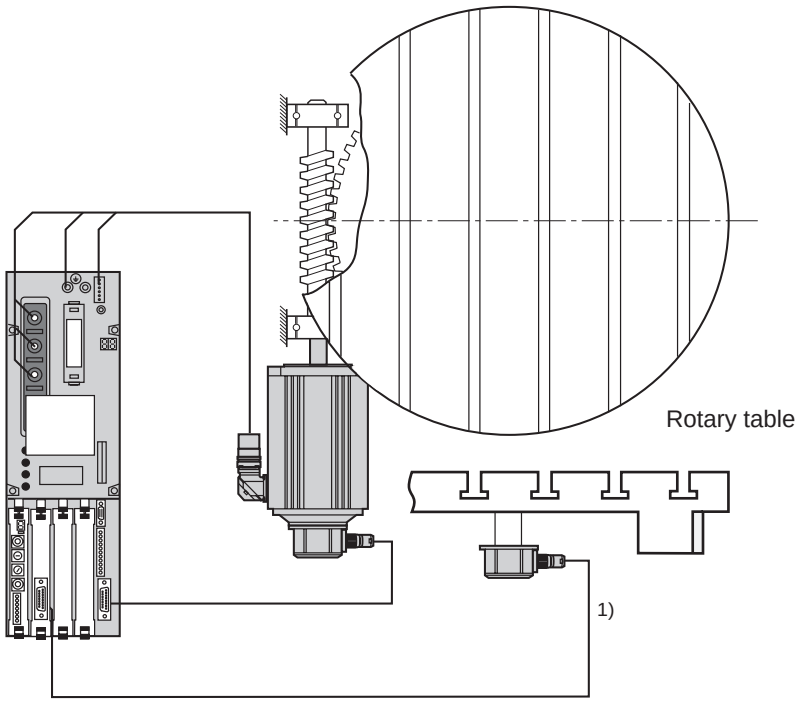
Typical application examples are shown in the following two pictures:



1) direct position actual feedback acquisition via an external measuring system

Ap5031f1.fh7

Fig. 7-18: Application: External encoder with linear servo axis



1) direct position actual feedback acquisition via an external measuring system

Ap5032f1.fh5

Fig. 7-19: Application: External encoder with rotary servo axis

The external encoder is parameterized with the

- **P-0-0075, Interface Feedback 2, external**
- **S-0-0117, Resolution of external feedback**
- **S-0-0115, Position feedback 2 type parameter**
- **P-0-0185, Function of ext. Encoder**

parameters. These specify the interface number to which the measurement system is connected, the resolution of the external encoder, as well as the direction of movement, etc. The parameter **S-0-0053, Position Feedback Value 2 (Ext. Feedback)** displays the position of the external encoder.

Set the reference measure to the machine zero point as follows:

- **S-0-0148, C600 Drive controlled homing procedure command**

or, for absolute encoders,

- **P-0-0012, C300 Command 'Set absolute Measurement'**

The external encoder can be used for different purposes.

The evaluation mode for the external encoder is set in parameter **P-0-0185, Function of ext. Encoder**.

Value in P-0-0185, Function of ext. Encoder	Definition
0	external encoder as additional load-side control encoder for position and/or velocity control loops
2	external encoder as only load-side control encoder (only with rotary asynchronous motors)

Fig. 7-20: Function of the external encoder

Determining the Encoder Interface of the External Encoder

The encoder interface of the external encoder is determined with the parameter **P-0-0075, Interface Feedback 2, external**. The number of the module to which the external encoder is connected must be entered in this parameter.

The following measuring systems and modules for the evaluation of an external encoder are allowed:

Feedback System:	Module:	Number:
None	--	0
Digital servo feedback	Standard	1
Incremental encoder with sine signals from the Heidenhain Company, with either uA or 1V signals	DLF01.1M	2
Indramat gear-type encoder	DZF02.1M	3
Digital servo feedback from the Heidenhain or Stegmann companies	DFF01.1M	4
Incremental encoder with square-wave signals from the Heidenhain company	DEF01.1M	5
Incremental encoder with square-wave signals from the Heidenhain company	DEF02.1M	6
Encoder with SSI interface	DAG01.2M	7
Encoder with EnDat interface	DAG01.2M	8
Gearwheel encoder with 1Vpp signals	DZF03.1M	9

Fig. 7-21: Encoder interface of the external encoder

If 0 is entered as the module number, the encoder evaluation of the external encoder is switched off.

Warning

Do not use an encoder with an SSI-interface in the velocity control and position control operating modes.

⇒ Long dead times occur when reading the SSI-interface.

External Encoder Resolution

To parameterize the resolution of the external encoder use the parameter **S-0-0117, Resolution of external feedback**. This parameter indicates the number of lines of the external encoder. If using a measurement system with intrinsic feedback data storage, the resolution will be taken from this and does not need to be entered. Measurement systems with feedback storage are available if

- **Standard (1) ,**
- **DFF (4) or**
- **DAG 1.2 (8)**

is used as the external encoder interface.

Depending on whether a rotary or linear measurement system was parameterized in bit 0 of **S-0-0115, Position feedback 2 type parameter**, the unit and number of digits after the decimal is switched by **S-0-0117, Resolution of external feedback**.

Rotary: Cycles/Rev.

Linear: 0.00001 mm

Actual Feedback Value Monitoring

In applications where an external measurement system is used, the position feedback monitor can offer an additional margin of safety. The position feedback monitor can diagnose the following errors of the axis:

- Slip in the drive mechanical system
- Measurement system errors (as far as this is not recognized by the other measurement system monitors)

To set the monitor function use the parameter

- **S-0-0391, Monitoring Window ext. feedback**

If an error occurs, the error message **F236 Excessive Position Feedback Difference** is generated.

Basic Operating Characteristics of the Position Feedback Monitor

The position feedback monitor compares the position feedback value of the motor encoder with the external encoder. If the deviation of both position values is greater than **S-0-0391, Monitoring Window ext. feedback**, the error **F236 Excessive Position Feedback Difference** is generated. As a result, the motor and external encoder position status' are cleared.

The position feedback value is only active if an external encoder is available and evaluated and if **S-0-0391, Monitoring Window ext. feedback** is not parameterized with a 0.

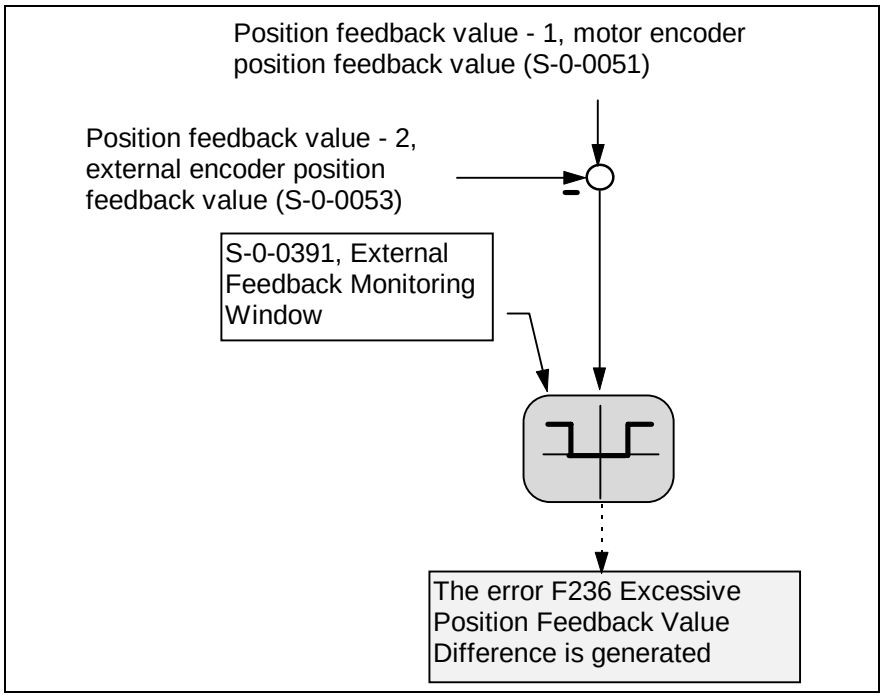

Position feedback value - 1, motor encoder position feedback value (S-0-0051)
Position feedback value - 2, external encoder position feedback value (S-0-0053)
S-0-0391, External Feedback Monitoring Window
The error F236 Excessive Position Feedback Value Difference is generated

Fig. 7-22: Position feedback value monitoring schematic

Setting the Position Feedback Monitoring Window

The requirements for setting the position feedback value monitor are:

- All drive regulator loops must be set correctly.
- The axis mechanical system must be in its final form.
- The axis must be homed.

The monitoring window must be determined according to the application. The following basic procedure is recommended for doing this:

- Run a typical operating cycle. While doing this, set the planned acceleration and velocity data of the axis.
- Enter progressively smaller values in the parameter **S-0-0391, Monitoring Window ext. feedback** until the drive gives the error message **F236 Excessive Position Feedback Difference**. Depending on the mechanical system, you should start with 1..2 mm and decrease the window in steps of 0.3 ... 0.5 mm.

- The value at which the monitor is triggered should be multiplied with a tolerance factor of 2 ... 3 and entered in parameter **S-0-0391, Monitoring Window ext. feedback**.

When determining the monitoring window, make sure that the position feedback monitor works dynamically. This means that even dynamic deviations of both position feedback values in acceleration and braking phases are registered. This is why it is not enough to use statical axis errors as the basis for the setting.

Deactivating the Position Feedback Monitor

It is possible to turn off the position feedback monitor in applications where the externally connected measurement system does not control the axis position but is used for other measurements. To do this, enter 0 in the parameter **S-0-0391, Monitoring Window ext. feedback**.

Other External Encoder Characteristics

To parameterize any other characteristics of the external encoder, such as

- Direction of movement not-inverted/inverted
- Distance-coded home mark yes/no
- Rotary / linear measurement system
- Absolute evaluation possible
- Absolute evaluation activated

use **S-0-0115, Position feedback 2 type parameter**

The structure of this parameter is as follows:

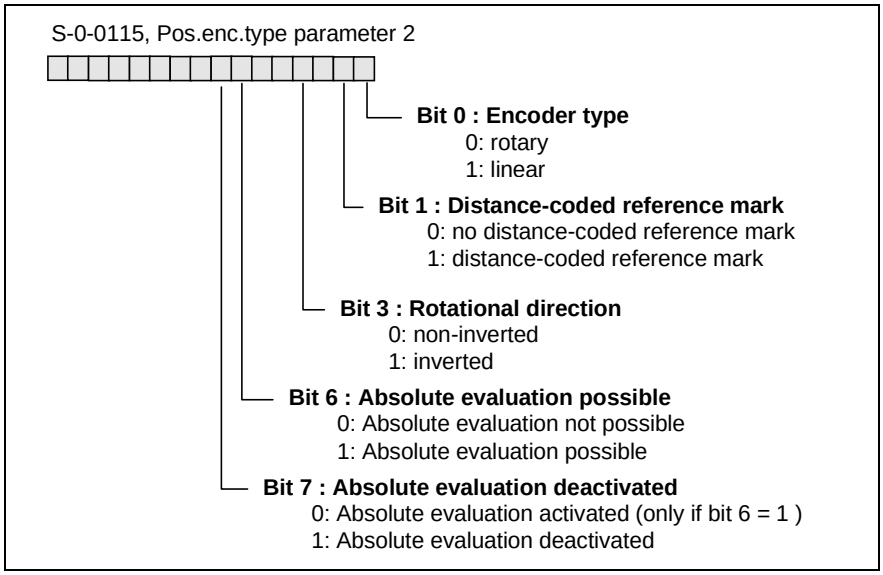

S-0-0115, Pos.enc.type parameter 2
Bit 0 : Encoder type
0: rotary
1: linear
Bit 1 : Distance-coded reference mark
0: no distance-coded reference mark
1: distance-coded reference mark
Bit 3 : Rotational direction
0: non-inverted
1: inverted
Bit 6 : Absolute evaluation possible
0: Absolute evaluation not possible
1: Absolute evaluation possible
Bit 7 : Absolute evaluation deactivated
0: Absolute evaluation activated (only if bit 6 = 1)
1: Absolute evaluation deactivated

Fig. 7-23: Parameter S-0-0115

The bits in the position encoder type parameter are partly set or cleared by the drive itself. There is following dependency:

- Depending on the absolute encoder range and the maximum travel range or modulo value, bit 6 is either set or cleared.

(See also "Other Settings for Absolute Measurement Systems".)

Actual Feedback Values of Non-Absolute Measurement Systems After Initialization

If an absolute measurement system is not available, then the position feedback values in the command **S-0-0128, C200 Communication phase 4 transition check** are initialized as shown below, depending on whether the parameter **P-0-0019, Position Start Value** was written in the previous communication phase 2 or 3 or not.

P-0-0019 written:	Position feedback value 1	Position feedback value 2
no	init. motor encoder raw value	init. motor encoder raw value
yes	position start value	position start value

Fig. 7-24: Non-absolute measurement system position feedback values after initialization

Warning

No valid position feedback values exist before the measurement system is initialized.
The initialization is done in the transition check for communication phase 4.

Some measurement systems have limitations concerning the maximum velocity during their initialization.

Measurement system	Max. initialization velocity
DSF	300 Rpm
EnDat	Initialization should occur at standstill
Multiturn resolver	300 Rpm

Fig. 7-25: Velocity allowed during initialization

Drive-internal format of position data

There are two different formats in the drive used to display position data. We differentiate between

- **display format** and
- **drive-internal format**.

The **display format** defines the unit, i.e., the LSB value with which the position data are exchanged between drive and control/surface. When a position data parameter such as, **S-0-0051, Position Feedback Value 1 (Motor Feedback)** is read, it is sent in this format to the control. The display format is set with parameter **S-0-0076, Position Data Scaling Type**, **S-0-0077, Linear Position Data Scaling Factor**, **S-0-0078, Linear Position Data Scaling Exponent** and **S-0-0079, Rotational position resolution**. The control generally sets the format.

(See also "Physical Values Display Format“.)

The drive-internal positon resolution depends on the travel range to be described

The **drive-internal format** determines the LSB value, the position command and feedback value editing as well as how the position control loop in the drive is performed. The drive uses the value of parameter **S-0-0278, Maximum travel range** to calculate the drive-internal format.

Note: If the value set in **S-0-0278, Maximum travel range** is used as set at delivery, then the drive-internal format generally meets most demands given a sufficiently high resolution. Only if excessively high demands are made of the drive-internal format of the position data or with very long travel ranges it becomes necessary to optimize the setting.

Functional principle of the drive-internal position data formats

Position data processing in the drive has a constant data width from which the resolution of the position data to cover the travel range of the axis depends.

It applies:

Note: The longer the distance to be represented, the smaller the drive-internal position resolution.

These parameter values are used to compute the **drive-internal resolution**:

- **S-0-0116, Resolution of motor feedback** and
- **S-0-0256, Multiplication 1**.

The parameters for the encoder resolution are listed in the data sheets of the measuring system or they are automatically read out of the feedback memory if such a measuring system is present. The number of lines per encoder revolution or the grid constant of a linear scale (distance per

division period) is set there. The parameter values for the multiplication are calculated by the drive during command **S-0-0128, C200 Communication phase 4 transition check**. They describe the resolution per division period.

It thus applies for the drive-internal resolution:

for rotary motors:

$$\text{Resolution} = \text{encoder resolution} \times \text{multiplication} \left[\frac{\text{Incr}}{\text{rev}}\right]$$

Resolution:	drive-internal resolution of position data
multiplication:	value in S-0-0256 or S-0-0257
encoder resolution:	value in S-0-0116 or S-0-0117

Fig. 7-26: Drive-internal resolution of rotary motors

and for linear motors:

$$\text{Resolution} = \frac{\text{multiplication}}{\text{encoder resolution}} \left[\frac{\text{Incr}}{\text{mm}}\right]$$

Resolution:	drive-internal resolution of positon data
multiplication:	value in S-0-0256 or S-0-0257
encoder resolution:	value in S-0-0116 or S-0-0117

Fig. 7-27: Drive-internal resolution of linear motors

Examples:

1. MKD motor, S-0-0116 = 4, S-0-0256 = 32768, therefore: drive-internal resolution = 131072 increments/motor revolution, therefore, an LSB value of 0.00275 degrees.
2. Linear scale as external measuring system, S-0-0117 = 0.02 mm (grid division = 20µm), S-0-0257 = 32768, therefore: drive-internal resolution of approximately 1638400 increments/mm, therefore, an LSB value of 0.00061 µm (How to compute the drive-internal resolution if an external encoder is used, is described in greater detail below).

Note: The value for the multiplication is limited to 4 .. 4194304 for technical reasons.

Setting the drive-internal position data format

To set the drive-internal resolution, use the parameter

S-0-0278, Maximum travel range.

Setting the maximum travel range at start-up

This parameter must be set at the time where an axis is commissioned to a value that equals at least the distance that the axis must travel. While executing the command **S-0-0128, C200 Communication phase 4 transition check,** the drive computes the values for **S-0-0256, Multiplication 1** and, if an external measuring system is mounted, for

S-0-0257, Multiplication 2 as well. These parameters thus help to display the resolution.

Multiplication is only reduced if the travel range can no longer be described

The maximum possible resolution of the position feedback value of a position encoder for technical reasons equals 32768 increments per division period of the measuring system. This maximum resolution is only reduced if the travel range is set so large that it can no longer be described with the maximum resolution.

To compute the **multiplication**, the following calculations are conducted in the command **S-0-0128, C200 Communication phase 4 transition check**:

for **rotary** measuring systems:

$$\text{multiplication} = \frac{2^{31}}{\text{travel range} \times \text{encoder resolution}}$$

travel range:	travel range shown in encoder revolutions
multiplication:	value in S-0-0256 or S-0-0257
encoder resolution:	value in S-0-0116 or S-0-0117

Fig. 7-28: Relationship between maximum travel range and multiplication with rotary measuring systems

Examples:

1. MDD motor with S-0-0116 = 512, maximum travel range 2048 motor revolutions, therefore, a multiplication of 2^31 / (2048 • 512) = 2048.
2. MDD motor with S-0-0116 = 512, maximum travel range 20 motor revolutions, therefore, a multiplication of 2^31 / (20 • 512) = 209715. The next higher value equals 32768, thus a multiplication = 32768.

for linear scales:

$$\text{multiplication} = \frac{2^{31} \times \text{encoder resolution}}{\text{travel range}}$$

travel range:	travel range shown in mm
multiplication:	value in S-0-0256 or S-0-0257
encoder resolution:	value in S-0-0116 or S-0-0117

Fig. 7-29: Relationship between maximum travel range and multiplication in linear scales

Example:

Linear scale with 0.02mm grid division, maximum travel range 5m, therefore a multiplication of 2^31 × 0.02 / 5000 = 8589 (→ 8192).

This results in a resolution of 0.02mm / 8192 = 0.002441 µm.

Note: When computing multiplication always use the next lower binary value of the precise results.

Drive internal representation of position data when an external encoder is present

If an external encoder is mounted, the multiplication of the motor encoder is guided by the external encoder

If there is an external measuring system, then the multiplication of this encoder is computed as per the above formula in terms of the travel range set. The multiplication of the motor encoder is calculated so that it also covers this travel range. This means that values exceeding 32768 can be generated depending on the mechanical transformation elements!

Example: MKD motor with rotary external encoder

motor encoder resolution	= 4
external encoder resolution	= 1000
travel range	= 50 revolutions
gear ratio	= 1:1

1. Calculating the multiplication of the external encoder:

2^31 / (1000 • 50) = 42949, technical maximum 32768, thus S-0-0257 = 32768.

This results in a resolution of 0.00001098 Degrees.

2. Calculating the multiplication of the motor encoder

2^31 / (4 • 50) = 10737418, the next smaller binary value = 8388608, thus S-0-0256 = 8388608. However, the technical maximum resolution is 4194304. Therefore, we set the value in S-0-0256 to 4194304. The resolution is 0.0002146 Degrees.

The resolution can never exceed 4194304 • S-0-0116!

Example: MDD motor with linear external encoder

Resolution of the motor encoder	= 256
Resolution of the external encoder	= 0.02 mm
Travel range	= 5 m
feed constant	= 10 mm
Gear transmission ratio	= 3:1

1. Calculating the multiplication of the ext. encoder :

2^31 • 0.02mm / 5000mm = 8589

Technically reasonable is a maximum of 8192, therefore

S-0-0257 = 8192. This gives a resolution of 0.00244 µm.

2. Calculation of the Multiplication of the motor encoder:

5m of travel range give 500 gear output revolutions and therefore 1500 gear input revolutions (motor revolutions).

2^31 / (256 • 1500) = 5592, the nearest smaller binary value = 4096, therefore S-0-0256 = 4096.

This results in a resolution of 0.000343 Degrees referred to the motor shaft.

Processing format of the drive-internal position command interpolator

In the drive-internal position command interpolator, the position command profile for the drive-controlled travel commands such as drive halt, drive-controlled homing, operating mode drive-internal interpolation and so on are generated. The format of the drive-internal position data affect the maximum acceleration limit which can be pre-defined for the interpolator.

The limits are not valid for cyclic command values, e.g. in operation mode Position control.

The following relationships apply:

for **rotary** motors:

$$amax = \frac{51.471.854.040}{\text{encoder resolution} \times \text{multiplication}} \left[\frac{rad}{s^2}\right]$$

amax: maximum acceleration of position command of the interpolator
encoder resolution: value in S-0-0116
multiplication: value in S-0-0256

Fig. 7-30: Maximum acceleration of the position command interpolator as dependent on the drive-internal position data format

for **linear** motors:

$$amax = \frac{8.192.000.000 \times \text{encoder resolution}}{\text{multiplication}} \left[\frac{mm}{s^2}\right]$$

amax: maximum acceleration of position command of the interpolator
encoder resolution: value in S-0-0116 in mm
multiplication: value in S-0-0256

Fig. 7-31: Maximum acceleration of the position command interpolator as dependent on the drive-internal position data format

Example:

MDD motor with S-0-0116 = 512, multiplication = 32768, equalling a maximum acceleration of the position command interpolation of 3067 rad/s².

7.3 Other Settings for Absolute Measurement Systems

Motor and/or external encoders can be used as absolute encoders

As motor and/or external measuring system those measuring systems can be used that supply absolute position information within one or several revolutions (single or multiturn encoder) or a within a specific traversing distance (absolute linear scales). These measuring systems need not be homed after every drive firmware initialization or power on. The feedback position relative to the machine zero point is available after initialization. It is necessary to run the setup (homing procedure) only once.

Whether a motor or an external measuring system is evaluated as an absolute encoder depends on the following:

- the absolute range of the encoder, i.e., how many revolutions or the path that the encoder can describe in absolute terms;
- the selected position scaling (position described absolute or modulo) in **S-0-0076, Position Data Scaling Type;**

- the travel range set in **S-0-0278, Maximum travel range** or
- the modulo value set in parameter **S-0-0103, Modulo Value.**

Note the following relationships:

Position scaling (bit 6 of S-0-0076)	S-0-0278, Max. travel range	S-0-0103, Modulo value	Absolute encoder evaluation possible
Absolute format	<= ½ Absolute range	not relevant	yes
	> ½ Absolute range	not relevant	no
Modulo format	S-0-0103	<= Absolute range	yes
	S-0-0103	> Absolute range	no

Fig. 7-32: Absolute encoder evaluation in terms of position format, modulo format and maximum travel range

The check whether a measuring system can be evaluated as an absolute system or not is conducted during command **S-0-0128, C200 Communication phase 4 transition check**. The results are displayed in bit 6 of the relevant position encoder type parameter (S-0-0277 / S-0-0115).

Activating the absolute encoder evaluation

If the absolute evaluation of a measuring system is possible but not wanted, this can be deselected in bit 7. The measuring system is then treated as if it were a non-absolute (single turn) encoder.

The position encoder type parameter is structured as follows:

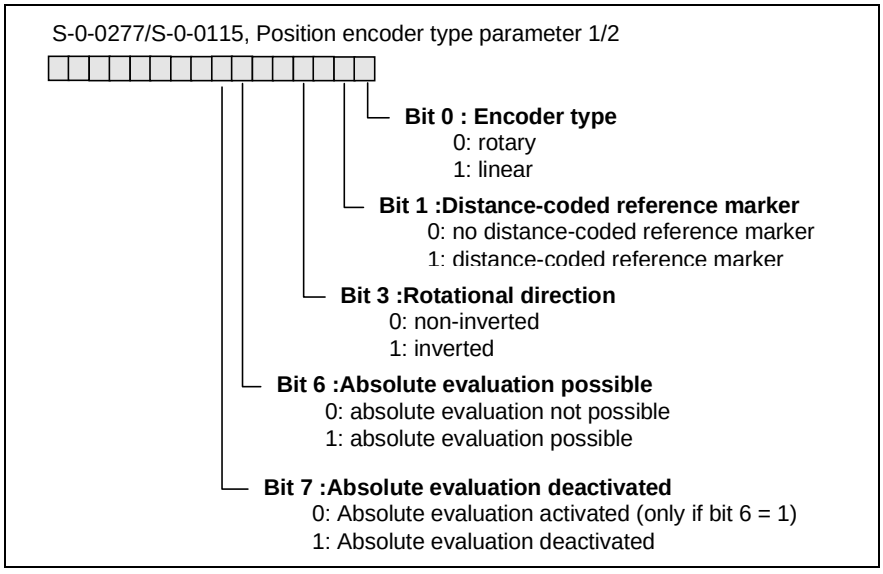

S-0-0277/S-0-0115, Position encoder type parameter 1/2
Bit 0 : Encoder type
0: rotary
1: linear
Bit 1 :Distance-coded reference marker
0: no distance-coded reference marker
1: distance-coded reference marker
Bit 3 :Rotational direction
0: non-inverted
1: inverted
Bit 6 :Absolute evaluation possible
0: absolute evaluation not possible
1: absolute evaluation possible
Bit 7 :Absolute evaluation deactivated
0: Absolute evaluation activated (only if bit 6 = 1)
1: Absolute evaluation deactivated

Fig. 7-33: Structure of the position encoder type parameter

The following table shows which absolute measuring system can be used as a motor encoder or external encoder and which plug-in module is needed for it:

Measuring system:	Module (no.)	as motor encoder:	as external encoder:
Single/Multiturn DSF	Standard(1)	yes	yes
Single/Multiturn DSF	DFF01.1U(4)	no	yes
Single/Multiturn resolver	Standard(1)	yes	no
SSI encoder with 4096 incr/rev	DAG01.2U(7)	no	yes
Linear scale from Heidenhain with EnDat interface	DAG01.2U(8)	yes	yes
Single/multiturn rotary encoder from Heidenhain with EnDat interface	DAG01.2U(8)	yes	yes

Fig. 7-34: Modules needed for absolute measuring systems

Except for the SSI-encoder, the measurement systems have a data memory, from where the drive can read the information on whether the measurement is absolute or not.

Conditions for absolute encoder evaluation

The evaluation of the absolute encoder is only functional as long as the surrounding conditions do not change. Only in this case it is possible to use the raw position feedback value initialized in command **S-0-0128, C200 Communication phase 4 transition check** of the absolute measuring system to determine the machine zero point related position feedback value. The conditions for the conversion of the machine zero point related position feedback value are made up of:

Monitoring the conditions for absolute encoder evaluation

- the rotational direction of the measuring system set in bit 3 of parameters **S-0-0277, Position feedback 1 type parameter or S-0-0115, Position feedback 2 type parameter;**
- the position polarities set in **S-0-0055, Position Polarity Parameter** as well as
- the multiplication determined from **S-0-0278, Maximum travel range** displayed in parameters **S-0-0256, Multiplication 1** or **S-0-0257, Multiplication 2.**

If one of these three conditions changes, then the position status of the relevant measuring systems is cleared (**S-0-0403, Position feedback value status** = 0) and the error **F276 Absolute encoder error, position deviation > P-0-0097.**

Set Absolute Measuring

When an absolute measuring system is installed, its position feedback value displays a value that is arbitrary and has no relationship to the machine's zero point. In this case, the value of the **S-0-0403, Position feedback value status** parameter is 0.

In contrast to non-absolute measuring systems, the absolute dimensions in absoute measuring systems are established only once at the initial start-up of an axis.

The position feedback value of this measurement system can be set to the desired value with the command "Set Absolute Measuring." After absolute measuring (dimension) is set, the position feedback value of the encoder has a defined relationship to the machine's zero point.

All information will be available after reset because all necessary data from the absolute dimension system is stored in encoder data memory or in parameter data memory. The position feedback value retains its reference to the machine's zero point.

The following parameter is available for executing the function:

- **P-0-0012, C300 Command 'Set absolute Measurement'**

In addition, the following parameters are needed or are affected by the function:

- **S-0-0147, Homing Parameter**
- **S-0-0052, Reference distance 1**
- **S-0-0054, Reference distance 2**
- **S-0-0403, Position feedback value status**

"Set Absolute Measuring" Functional Principle

The feedback connected to the mechanical system is brought to an exactly measured position. The value desired for the position feedback value of the measurement system is entered in the parameter **S-0-0052, Reference distance 1** (for motor encoder) or **S-0-0054, Reference distance 2** (for external encoder). Then the command **P-0-0012, C300 Command 'Set absolute Measurement'** is started. The position feedback value is set to the value in the respective reference distance and the position status becomes 1.

If only one absolute measurement system is available, the command automatically refers to this measurement system. If 2 absolute measurement systems are connected, the selection is conducted according to bit 3 of **S-0-0147, Homing Parameter**.

When the command is executed, 3 different cases can be distinguished :

1. Set absolute measuring without drive enable.
2. Set absolute measuring with drive enable, function executed by subsequently starting the command "Drive Controlled Homing Procedure".
3. Set absolute measuring with drive enable, function executed by subsequently clearing the drive enable.

Set absolute measuring without controller enable

When absolute measuring is set without drive enable, the axis is moved to the exactly measured position and, while the drive enable is turned off, the command **P-0-0012, C300 Command 'Set absolute Measurement'** is started, after the reference distance has been written with the desired position feedback value at this position.

The command immediately sets the position feedback value of the measurement system to the reference distance, and the position status becomes 1. The command is finished in the drive and can be cleared.

Normally, this simple method of executing the command is all you need. However, if the application is dealing with a "vertical axis" (vertical) or if the approached position cannot be held without drive enable for another reason, the command can also be done with drive enable under specific conditions.

(See 2. or 3. from: Set Absolute Measuring Functional Principle.)

Setting Absolute Dimension Under Controller Enable and Subsequent "Drive-Controlled Homing"

Homing: Setting absolute dimension command, the position feedback value of a controlled axis can be changed. This may be necessary with "vertical axis," for example.

The procedure is as follows :

- Move the axis to the measured position.
- Enter the desired position feedback value in the appropriate reference distance parameter.
- Start the command **P-0-0012, C300 Command 'Set absolute Measurement'** The position data will not be switched yet.
- Start the command **S-0-0148, C600 Drive controlled homing procedure command** this feature recognizes that it is dealing with an absolute measurement system and executes "Set Absolute Dimension" or, in other words, the position feedback value is set to the reference distance. The position command value (**S-0-0147, Homing Parameter**) is simultaneously set to the same value. As with each execution of "drive-controlled homing," the position command value is read via the service channel and the control system's position command value is set to this value before the homing command is cleared.

  Warning:
  Make sure that the encoder to be set is selected in bit 3 of **S-0-0147, Homing Parameter**
- Clear the command **P-0-0012, C300 Command 'Set absolute Measurement'**

Set absolute dimension (measuring) during controller enable, then turn off the controller enable

Setting absolute measuring: with CE and subsequent CE switch off, the position feedback value of a controlled axis can be changed. Switching the position feedback value occurs after the drive enable is turned off.

The procedure is as follows :

- Move the axis to the measured position
- Enter the desired position feedback value in the appropriate reference distance parameter.
- Start the command **P-0-0012, C300 Command 'Set absolute Measurement'** (Measuring). The position data will not be switched yet.
- Turn off the drive enable, the position feedback value is set to the reference distance, the command is terminated in the drive.
- Clear the command **P-0-0012, C300 Command 'Set absolute Measurement'**

Set the actual feedback values according to the absolute dimension

The state of the position feedback values from the motor encoder and, if present, from the external encoder after executing the set absolute dimension command, depends on bit 3 in **S-0-0147, Homing Parameter** and the availability of an absolute encoder as the motor encoder or external encoder.

Motor encoder:	External encoder:	S-0-0147 bit 3:	Position feedback value 1:	Position feedback value 2:
Absolute	Non-absolute or not available	Any value	Reference distance 1	Reference distance 1
Non-absolute	Absolute	Any value	Reference distance 2	Reference distance 2
Absolute	Absolute	0	Reference distance 1	Unchanged
Absolute	Absolute	1	Unchanged	Reference distance 2

Fig. 7-35: Set position feedback values according to absolute measuring

Actual feedback values from absolute encoder after switching on

(See also "Position Feedback Values of Absolute Measurement Systems After Initialization".)

Possible error messages when setting the absolute dimension

While the command is being executed, the following command error(s) can occur:

- **C302 Absolute measuring system not installed**. The command **P-0-0012, C300 Command 'Set absolute Measurement'** has been started without an absolute measurement system being available.

Absolute Encoder Monitoring

If the absolute evaluation of a measuring system has been activated (position encoder type parameter S-0-0277 or S-0-0115 = 01xx.xxxxb), then the command **S-0-0128, C200 Communication phase 4 transition check** re-initialization of the position feedback value can be monitored. The monitoring principle functions as follows:

Functional principle of the absolute encoder monitor

When turning off the drive's power supply, the current actual position of the axis is loaded into resident memory. When switching the axis back on, the difference of the stored position and the newly initialized position of the measuring system is built. If this difference is greater than the parameterized position window in parameter **P-0-0097, Absolute encoder monitoring window**, the error message **F276 Absolute Encoder Error, Deviation > P-0-0097** is given.

Note: The monitor is deactivated if 0 is parametrized in P-0-0097, absolute encoder monitoring window.

The absolute encoder monitor is appropriate for the following applications:

- The motor is equipped with a holding brake.
- The drive mechanical system is self-locking and cannot be moved manually.

Note: If two absolute measuring system are mounted (motor and external encoder) then the monitor is only set to the encoder selected with bit 3 of **S-0-0147, Homing Parameter**.

Setting the Absolute Encoder Monitor

The absolute encoder monitoring window must be set by the user. Set the window according to how much the axis may move when it is turned off. Assuming that the axis has a brake or is self-locking, you can enter 0.1 motor revolutions (36° in reference to the motor shaft) as a standard value for the parameter **P-0-0097, Absolute encoder monitoring window**.

Absolute encoder monitoring with two absolute encoders

If there are absolute measuring systems and the absolute encoder monitor of the position data is activated, then the following restriction applies:

If both motor encoder and the external encoder are absolute measuring systems, then only that one is monitored as an absolute encoder that has been set in bit 3 of parameter **S-0-0147, Homing Parameter.**

See also absolute encoder monitoring.

Deactivating the Absolute Encoder Monitor

The absolute encoder monitor cannot be effectively used with axis that can or must be moved manually when switched off. The absolute encoder monitor should be turned off in such situations in order to prevent unnecessary error conditions.

The absolute encoder monitor can be turned off by writing 0 to P-0-0097.

Modulo Analysis of Absolute Measurement Systems

If there are absolute measuring systems and the modulo evaluation of the position data is activated, then the following restriction applies:

If both motor encoder and the external encoder are absolute measuring systems, then only that one is taken as an absolute encoder that has been set in bit 3 of parameter **S-0-0147, Homing Parameter**.

(See also "Modulo Feature" on page 7-8).

Actual Feedback Values of Absolute Measurement Systems After Initialization

The condition of the position feedback values of the motor feedback and, if available, of the external feedback after initializing the position feedback values in the command **S-0-0128, C200 Communication phase 4 transition check** depends on:

- Bit 3 in **S-0-0147, Homing Parameter**
- Availability of an absolute feedback as the motor or external feedback.

Motor feedback:	External feedback:	S-0-0147 Bit 3:	S-0-0051, Position feedback value 1:	S-0-0053, Position feedback value 2:	S-0-0403, Pos. status:
absolute	not absolute	0	absolute value of motor feedback	absolute value of motor feedback	1
absolute	not absolute	1	absolute value of motor feedback	absolute value of motor feedback	0
not absolute	absolute	0	absolute value of external feedback	absolute value of external feedback	0
not absolute	absolute	1	absolute value of external feedback	absolute value of external feedback	1
absolute	absolute	arbitrary	absolute value of motor feedback	absolute value of external feedback	1

Fig. 7-36: Position feedback values of absolute measurement systems after initialization

Note: Absolute position is lost with changes in polarity, scaling, gearbox and so on.

7.4 Drive Limitations

Current Limit

The current limit limits the command current to the parameters

- **P-0-4046, Active peak current** or
- **P-0-4045, Active permanent current**

The active continuous current designates the current that can be continuously taken from the drive, whereas the active peak current is only available for short periods of time.

If the peak current is demanded from the drive for longer periods of time, the drive controller's internal thermal load monitor will make sure that the allowable output current is reduced from the active peak current to the active continuous current. Both parameters are produced from the applicable drive controller data, such as the peak amplifier current (**S-0-0110, Amplifier Peak Current**) etc., as well as the contents of the following parameters:

- **P-0-4004, Magnetizing current** (for asynchronous motors)
- **S-0-0109, Motor Peak Current**
- **S-0-0111, Motor Current at Standstill**
- **S-0-0092, Bipolar Torque/Force Limit**
- **P-0-0109, Torque/force peak limit**
- **P-0-4011, Switching Frequency**

Setting the Active Peak Current

The parameter **P-0-4046, Active peak current** may not be set separately, but is instead a result of the following parameters:

- **S-0-0110, Amplifier Peak Current**
- **S-0-0109, Motor Peak Current**
- **P-0-4004, Magnetizing current**
- **S-0-0092, Bipolar torque/force limit value**
- **P-0-0109, Torque/force peak limit**

- In addition:The allowable peak amplifier current is limited to the **S-0-0109, Motor Peak Current**, if this is smaller.
- As the process continues, the value determined in the step before is reduced in connection with **P-0-4004, Magnetizing current**. The magnetizing current is 0 if there is a synchronous motor.
- Limit to **P-0-0109, Torque/force peak limit** and **S-0-0092, Bipolar Torque/Force Limit Value** (See also Torque/Force Limiting)

- Dynamic reduction during operation by monitoring the thermal load of the drive controller. (See also "Monitoring the Thermal Load" on page 7-39)

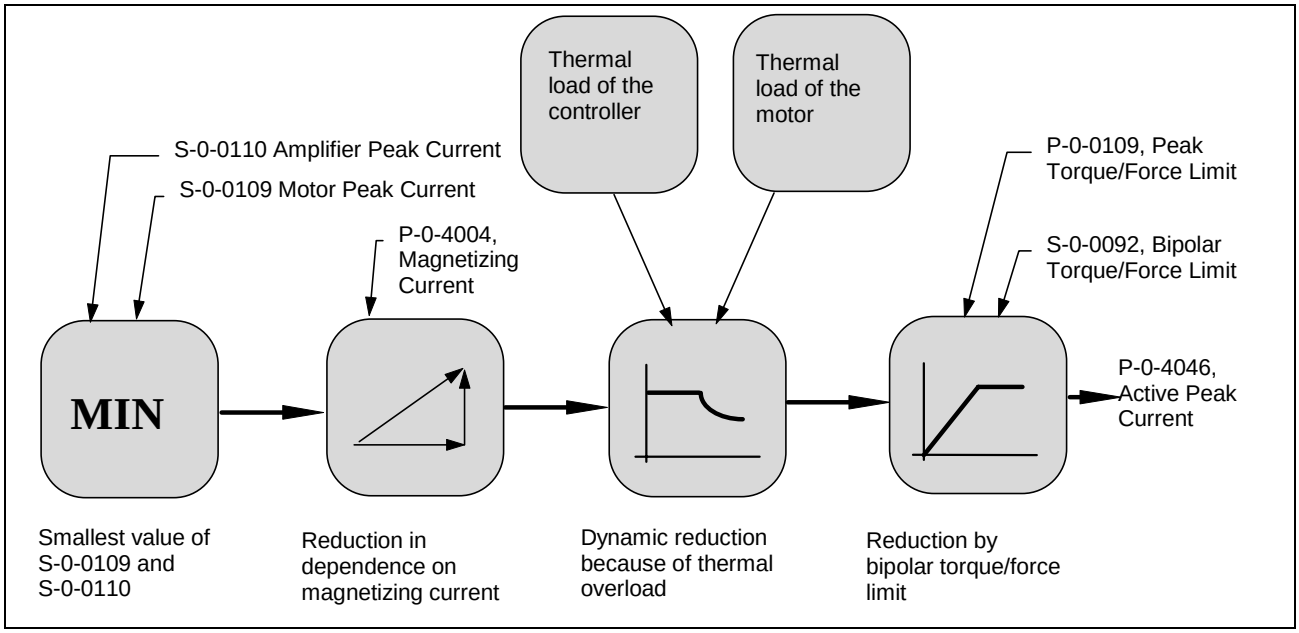

Thermal load of the controller
Thermal load of the motor
S-0-0110 Amplifier Peak Current
S-0-0109 Motor Peak Current
P-0-4004, Magnetizing Current
P-0-0109, Peak Torque/Force Limit
S-0-0092, Bipolar Torque/Force Limit
MIN
P-0-4046, Active Peak Current
Smallest value of S-0-0109 and S-0-0110
Reduction in dependence on magnetizing current
Dynamic reduction because of thermal overload
Reduction by bipolar torque/force limit

Fig. 7-37: Determining the torque-producing peak current

Setting the Active Continuous Current

The content of the parameter **P-0-4045, Active permanent current** is a result of the following parameters:

P-0-4011, Switching Frequency

- **P-0-4004, Magnetizing current**
- **P-0-4046, Active peak current**

To obtain this:

- The corresponding continuous current is determined from the selected switching frequency via the applicable drive controller data.
- As the process continues, the value determined under 1. is reduced in connection with **P-0-4004, Magnetizing current**. The magnetizing current is 0 if there is a synchronous motor.
- The determined value is limited to the **P-0-4046 Active peak current**.

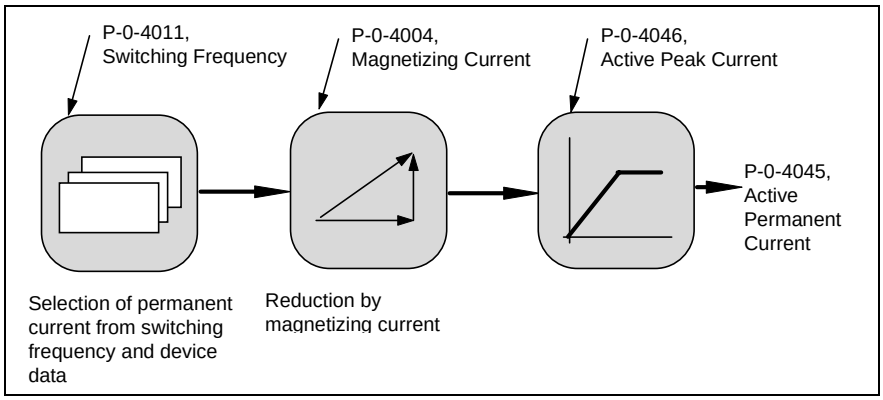

P-0-4011, Switching Frequency
P-0-4004, Magnetizing Current
P-0-4046, Active Peak Current
P-0-4045, Active Permanent Current
Selection of permanent current from switching frequency and device data
Reduction by magnetizing current

Fig. 7-38: Setting the active continuous current

Monitoring the Thermal Load

The thermal drive controller load indicates how much the drive controller's power stage unit is loaded by the delivered command current. To do this, information from the

- drive controller specific data ,
- the command current profile and
- the selected switch frequency

is used to continually calculate the power transistors' chip overtemperature. This may not become greater than the allowed chip overtemperature. If this condition is reached, the control drive will react by dynamically reducing the command current.

(See also Setting the Active Peak Current on page 7-37.)

The drive controller will generate the warning **E257 Continuous Current Limit active**.

For diagnostic purposes, a warning threshold can be set with **P-0-0127, Overload warning**. For practical purposes, a value of 80% thermal load is parameterized here. This value should not be exceeded during normal drive operation. If the thermal load exceeds the value parameterized in **P-0-0127, Overload warning**, the drive controller will generate the warning **E261 Continuous Current Limit Warning**.

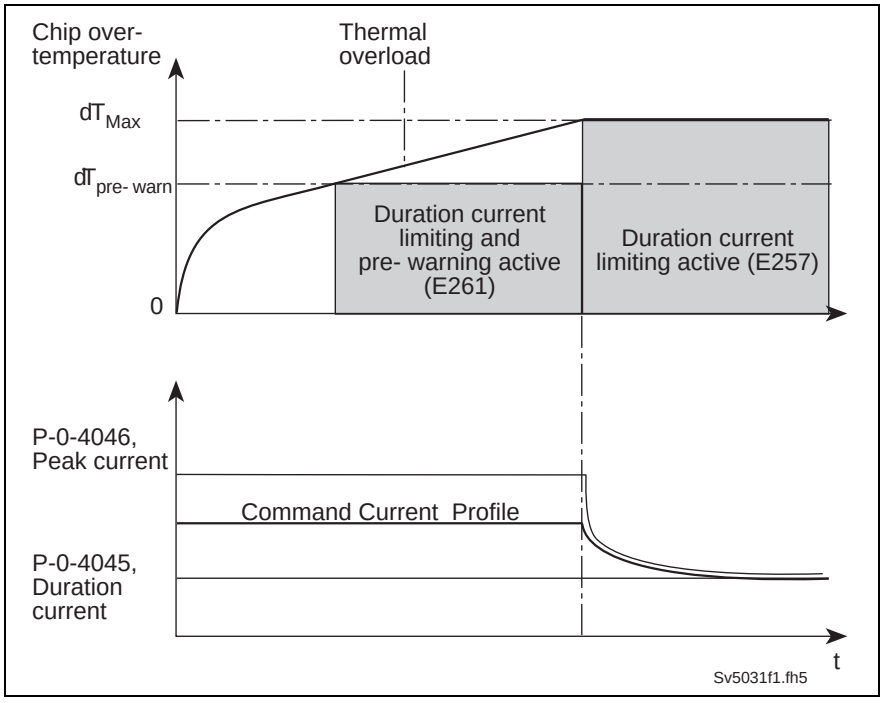


Fig. 7-39: Monitoring the thermal load and continous current limit

Checking the Thermal Load

The parameter **P-0-0141, Thermal drive load** is for diagnostic purposes. In this parameter, 0% corresponds to a chip overtemperature of 0 Kelvin, 100% corresponds to the maximum chip overtemperature. The thermal load should not exceed a value of 80% for the applied operating cycles if the drive is set up correctly. It typically takes about 10 minutes to warm up a drive controller's power stage to its final temperature. To check the thermal load of a drive during installation without having to run operating cycles during this period of time, the drive controller load can be preset with 80%. This can happen by writing an arbitrary value to the parameter **P-0-0141, Thermal drive load**. A typical operating cycle must be simultaneously run for a short while. The thermal load should be observed while this is being done, and it should show a falling tendency. Otherwise the drive is incorrectly set up for the application. To check the thermal load for further increase above 80%, the

- Overload warning by means of **P-0-0127, Overload warning** and/or
- the output of the thermal load at the analog output

may be used. The following illustration shows the typical process of the thermal load, as it can be observed by means of the analog output. During the execution of an operating cycle, the load is preset with 80% by writing to P-0-0141.

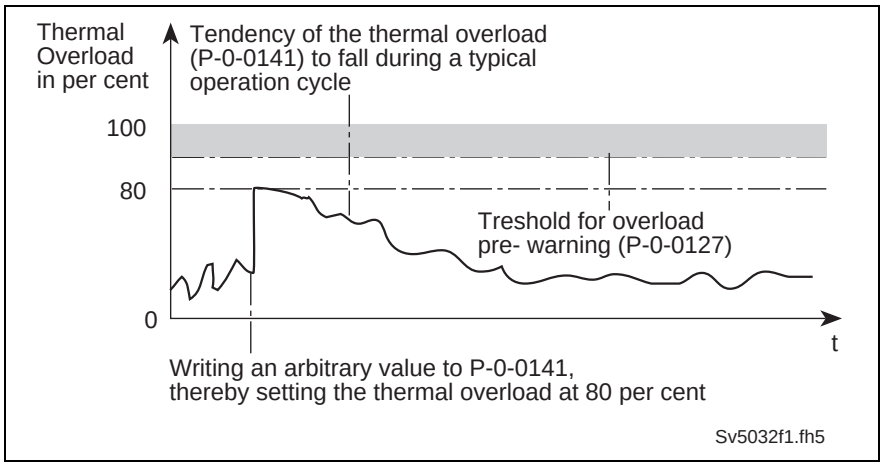


Fig. 7-40: Checking the Thermal Load

Monitoring of the thermal Motor Load

The motor may be loaded with 4 times the **S-0-0111, Motor Current at Standstill** for 400 ms. The permanently permissible current is 2.2 times that value. If the motor overload limit is active, then the warning **E225, Motor Overload** is generated, and the bit 0 (overload warning) is set in **S-0-0012, Class 2 Diagnostics**. The limited peak current is displayed in **P-0-4046, Active peak current**.

Torque/Force Limiting

The maximum allowable torque can be limited by the user with the parameters

- **S-0-0092, Bipolar Torque/Force Limit Value**
- **P-0-0109, Torque/force peak limit**

These parameters determine what percentage of **S-0-0111, Motor Current at Standstill** is made available to the user.

The parameter **S-0-0092, Bipolar Torque/Force Limit Value** is designed to allow variable limits of the maximum drive torque to values smaller than the maximum allowable drive torque while it is in operation. This is useful when temporarily moving toward a positive stop, for example.

Each drive produces a specific peak torque based on the maximum allowable current of the applicable motor/drive controller combination, which is desirable for acceleration procedures in many applications. Nevertheless, there are times when the maximum peak torque must be limited to lesser values for technical reasons specific to an application. The maximum peak torque of a drive can be limited as appropriate for an application with the parameter **P-0-0109, Torque/force peak limit**. The parameter overrides everything else to ensure that the maximum peak torque allowed for the application cannot be exceeded even if **S-0-0092, Bipolar Torque/Force Limit Value** is set arbitrarily high.

The maximum output current is thus determined together with the current limit, which is displayed in **P-0-4046, Active peak current.**

(See also Current Limit)

The following illustration shows the connection between the current limit and the torque/force limit of the maximum allowed torque in determining the maximum output current.

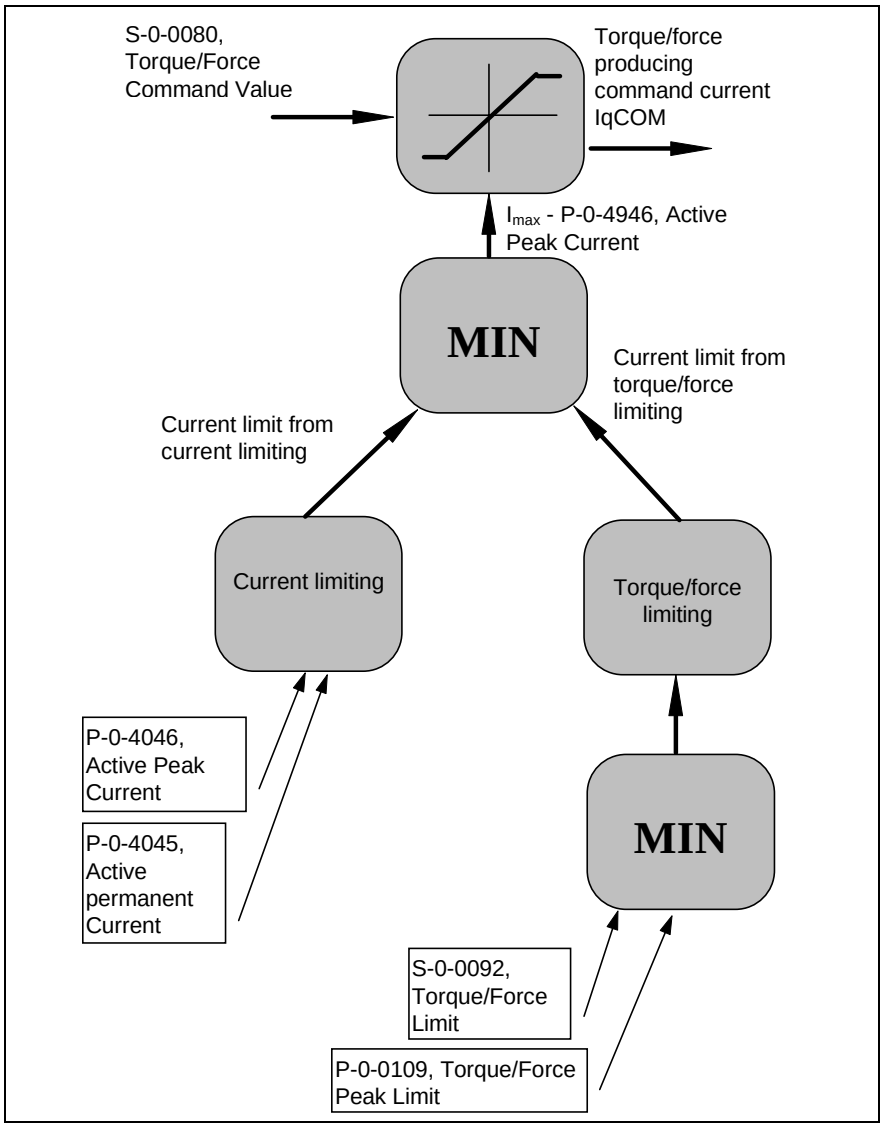


Fig. 7-41: Current limitation and torque/force limitation

The current limit and the torque/force limit both affect the torque-producing command current limit.

The active value is always the smaller value of

- Current limit value from current limitation
- Current limit value from torque/force limitation

This is displayed in the parameter **P-0-4046, Active peak current.**

Limiting Velocity

The following parameters limit the velocity of the drive:

- **S-0-0113, Maximum Motor Speed (nmax)**
- **S-0-0091, Bipolar Velocity Limit Value**

The parameter **S-0-0091, Bipolar Velocity Limit Value** is designed to allow variable limits of the maximum velocity to values smaller than the maximum allowable velocity during operation.

The parameter **S-0-0113, Maximum Motor Speed (nmax)** designates the maximum possible motor velocity. It is contained in the motor encoder data storage of MDD-, MKD and MKE motors and does not need to be entered, but with other types of motors this value must be taken from the motor parameter specifications.

Limiting to Maximum Motor Velocity

The maximum motor velocity defines the maximum velocity of the drive. It becomes active and is included in the calculation of

- the maximum value entered in the parameter **S-0-0091, Bipolar Velocity Limit Value**

Limiting to Bipolar Velocity Limit Value

The bipolar velocity limit value defines the maximum velocity of the drive for the user. It becomes active as

- the monitor of the encoder velocity in the **torque control** operating mode
- the limit for the resulting command value in the velocity controller
- the monitor of the position command value difference in the **position control** operating mode (see also "position command value monitoring")
- the limit of **S-0-0036, Velocity Command Value** in the **velocity control** operating mode

Monitoring the Feedback Velocity in the Torque Control Operating Mode

Monitoring the Feedback Velocity in the **Torque Control** operating mode occurs at 1.125 times the value of **S-0-0091, Bipolar Velocity Limit Value**. If this value is exceeded, the fatal error

- **F879 Velocity limit S-0-0091 exceeded**

is generated. The drive switches to torque-free operation afterwards.

Limiting the Resulting Command Value in the Velocity Controller

In all operating modes in which the velocity controller is active (all operating modes except for **Torque Control**), the given velocity command value is limited to the value of **S-0-0091, Bipolar Velocity Limit Value**. If this condition is reached, the warning

- **E259 Command Velocity Limit active**

is generated.

Limiting S-0-0036, Velocity Command Value in the Velocity Control Operating Mode

In the velocity control operating mode, the input of **S-0-0036, Velocity Command Value** is limited to **S-0-0091, Bipolar Velocity Limit Value**. If the value entered in S-0-0036 exceeds this limit, the warning

- **E263 Velocity command value > limit S-0-0091**

is generated.

Travel Range Limits

To avoid accidents and damages to the machine, many safety precautions are provided. A part of these safety measures refers to limiting the allowed working range. These limits can be introduced by following measures :

- Software limits in the control (only active with axis in reference)
- Position limits in the drive (only active with axis in reference)
- Limit switches in the drive
- Safety limit switches (in the emergency/safety chain)

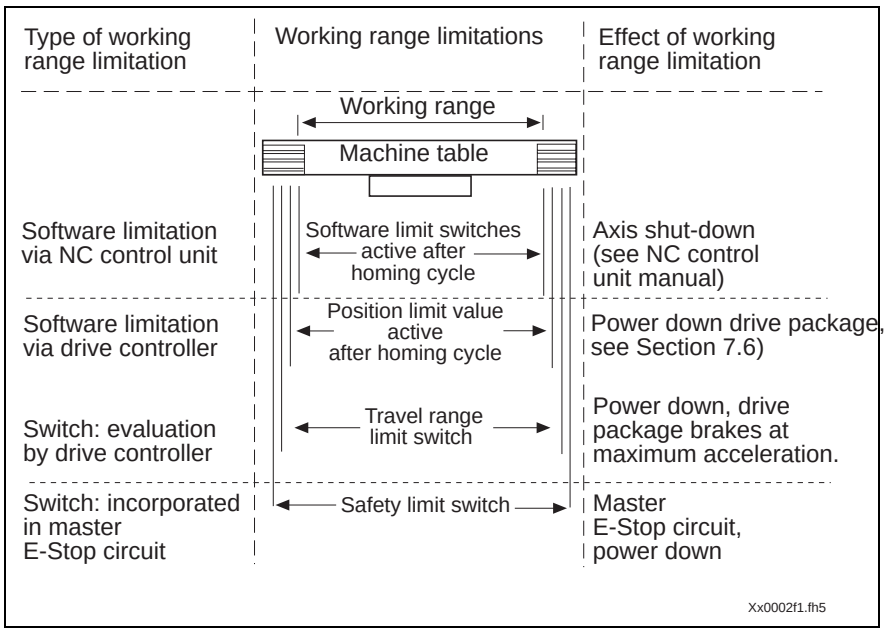

Type of working range limitation
Working range limitations
Effect of working range limitation
Working range
Machine table
Software limitation via NC control unit
Software limit switches active after homing cycle
Axis shut-down (see NC control unit manual)
Software limitation via drive controller
Position limit value active after homing cycle
Power down drive package, see Section 7.6)
Switch: evaluation by drive controller
Travel range limit switch
Power down, drive package brakes at maximum acceleration.
Switch: incorporated in master E-Stop circuit
Safety limit switch
Master E-Stop circuit, power down
Xx0002f1.fh5

Fig. 7-42: Effect and ways of limiting the working range

In the drive itself, there exist two methods..

These are the monitors for

- Travel zone limit switches and
- Position Limit Values for the axis

The travel range is exceeded when either a travel zone limit switch is activated or one of the two axis limit values is exceeded by the homed position feedback value that is, the value referring to the machine zero point.

The drive's response to exceeding the travel range is selectable. The following possibilities exist:

- An error with a "Set Velocity Command Value to Zero" reaction and automatic drive enable shutoff
- A warning with a "Set Velocity Command Value to Zero" reaction and automatic reset when the error conditions are gone.

This is set in bit 2 of **P-0-0090, Travel limit parameter**:

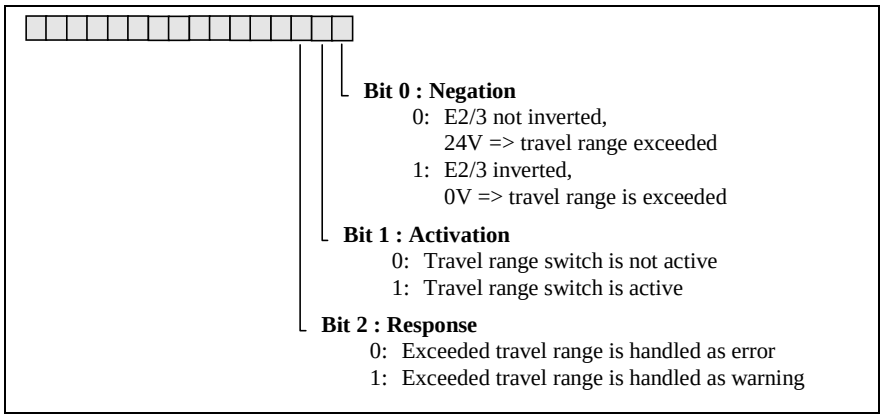

Bit 0 : Negation
0: E2/3 not inverted,
24V => travel range exceeded
1: E2/3 inverted,
0V => travel range is exceeded
Bit 1 : Activation
0: Travel range switch is not active
1: Travel range switch is active
Bit 2 : Response
0: Exceeded travel range is handled as error
1: Exceeded travel range is handled as warning

Fig. 7-43: Setting the drive reaction to exceeding the travel range (bit 2)

Note: It is not possible to bring the axis to a standstill with a command ramp (slope) over **P-0-1201, Ramp 1 pitch** (velocity ramp 1) (Best possible standstill = 2)! The braking to standstill always occurs with the maximum allowable torque/force. (See **P-0-4046, Active peak current**.)

Exceeding the Travel Range as an Error

If a 0 is entered in bit 2 of P-0-0090, then exceeding the travel range is handled as an error with the reaction of the velocity command value being set to zero. (See also "Velocity Command Value Reset".)

After the velocity command value has been set to zero, the drive turns off the internal drive enable and becomes torque-free. The ready-to-operate contact opens.

For re-installation

- Clear the error with the command **S-0-0099, C500 Reset class 1 diagnostic** or press the S1 button.
- Reactivate the drive with the 0-1 edge of the drive enable signal.

If the error condition is still present, that is, if the limit switch is still activated or if the axis limits are still exceeded, only command values that go back into the allowable range will be accepted. Monitoring the command values is dependent on the active operating mode.

The following applies:

Operating Mode:	Command Value Check:
Torque control	Polarity of **S-0-0080, Torque/Force Command**
All operating modes with drive-internal velocity control	Polarity of the internal velocity command value
All operating modes with drive-internal position control	Polarity of the velocity created by the given position command values

Fig. 7-44: Monitoring the command values in error conditions

If command values are given that would lead out of the allowable travel range, the travel range error will be generated again.

Exceeding the Travel Range as a Warning

If a 1 is entered in bit 2 of **P-0-0090, Travel limit parameter,** then exceeding the travel range as a warning is handled with setting the velocity command value to zero.

The drive does not turn off its internal drive enable. If the error condition is still present, that is, if the limit switch is still activated or if the axis limits are still exceeded, only command values that go back into the allowable range will be accepted. Monitoring the command values is dependent on the active operating mode. (See previous chapter.)

Travel Zone Limit Switch Monitoring

The monitor for exceeding the travel zone limit switch is only activated if

- the monitor is switched on in bit 1 of **P-0-0090, Travel limit parameter**

Exceeding the travel zone limit switch is recognized when these are activated. The diagnostic message depends on the type of reaction:

How handled:	SS display:	Diagnostic message:
As an error	F643	F643 Positive travel range limit switch activated/detected
	F644	F644 Negative travel range limit switch activated/detected
As a warning	E843	E843 Positive travel range limit switch activated/detected
	E844	E844 Negative travel range limit switch activated/detected

Fig. 7-45: Diagnostic message when travel zone limit switch is exceeded

Travel Zone Limit Switch - Connection

The drives in the DIAX family have 2 binary inputs available for connecting travel zone limit switches. These can be found in the DSS 2.1 plug-in module. The inputs are galvanically isolated and must be supplied with +24V by the same connector (X 12).

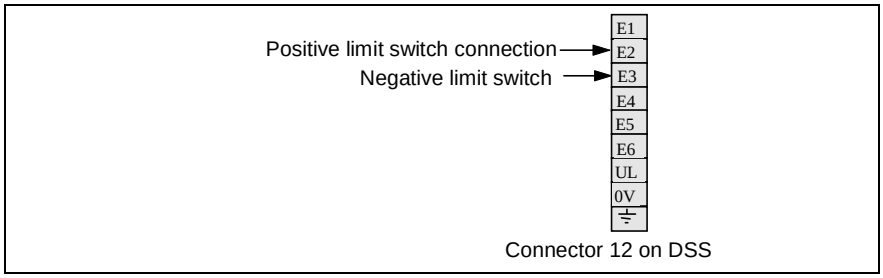


Fig. 7-46: Connecting the limit switches to X12

The travel zone limit switches are connected to the E2 and E3 inputs of the X12 connector.

Travel Zone Limit Switches - Activation and Polarity

The travel zone limit switches are activated with the parameter **P-0-0090, Travel limit parameter**. Additionally, the inputs can be inverted in this parameter (0V on E2/3 -> Travel range exceeded).

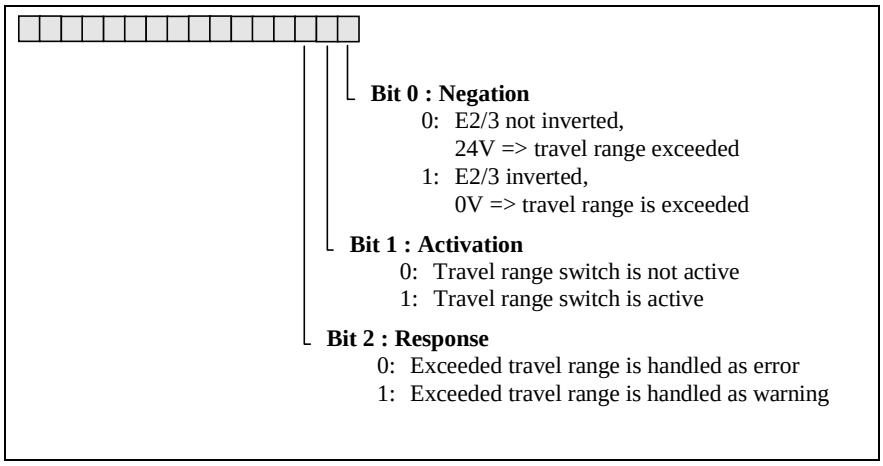

Bit 0 : Negation
0: E2/3 not inverted,
24V => travel range exceeded
1: E2/3 inverted,
0V => travel range is exceeded
Bit 1 : Activation
0: Travel range switch is not active
1: Travel range switch is active
Bit 2 : Response
0: Exceeded travel range is handled as error
1: Exceeded travel range is handled as warning

Fig. 7-47: Activating and negating the limit switches (bit 0 or 1)

If the monitor in bit 1 of P-0-0090 is turned on, the +24V DSS 2.1 +UL input monitor is simultaneously activated, if it was not already activated by using other X12 connector ports.

I.e.: if the +UL voltage falls below +18V, the error **F271 Error power supply travel limit switch** is generated.

Axis Limit Values

The monitor for exceeding the axis limit parameters:

- **S-0-0049, Positive position limit value**
- **S-0-0050, Negative position limit value**

is executed only if

- the encoder system of the active operating mode has been homed, i.e. the position encoder values are in relation to the machine's zero point. The **S-0-0403, Position feedback value status** is therefore 1

AND

- the monitor for the axis limit values in **S-0-0055, Position Polarity Parameter**, bit 4 was activated.

It is recognized that the axis limit values have been exceeded if the position feedback value of the active operating mode exceeds the travel range set by the axis limit values.

Bit 3 of the parameter **S-0-0147, Homing Parameter** determines whether the position feedback value of the motor encoder or of the external encoder is monitored. If drive-internal interpolation is used as the active operating mode, the drive checks to see if the target position is outside of the axis limit values. If it is, the drive will not move and the warning **E253, Target Position outside of Travel Zone** is generated, and bit 13 in parameter **S-0-0012, Class 2 Diagnostics** is also set.

The diagnostic message for the case that the axis limit values have been exceeded depends on the type of reaction:

How handled:	SS display:	Diagnostic message:
As an error	F629	F629 Positive position limit value exceeded
	F630	F630 Negative position limit value exceeded
As a warning	E829	E829 Positive position limit value exceeded
	E830	E830 Negative position limit value exceeded

Fig. 7-48: Diagnostic message when axis limits have been exceeded

Axis Limit Values - Activation

The axis limit value monitor is activated in bit 4 **of S-0-0055, Position Polarity Parameter**.

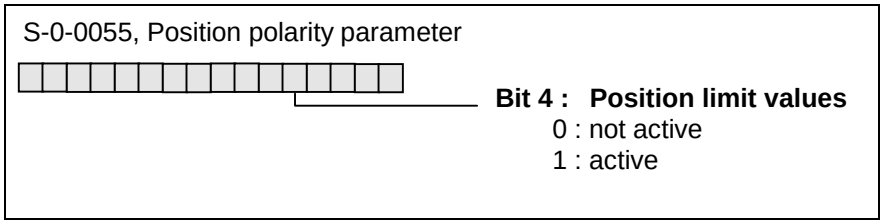


Fig. 7-49: Activating the axis limits

7.5 Drive Interlock Open

Manufacturing systems, transfer lines and tool machines often consist of physically separate work areas such as processing units, transport, distribution, and storage systems.

Persons in one of these areas must often do work in danger areas, while other parts of the machine continue to operate. If persons will be in the working area of a motor, it should be brought to a standstill and secured against inadvertent operation.

The drive interlock provides a security margin for inadvertent operation of a connected motor when an error occurs. It ensures that separate work areas in a machine or system are turned off.

The drive controllers of type DDS and DKR are equipped with a drive interlock. Activating the drive interlock separates the power output control electronics from the power output with a relay contact.

DANGER

Danger of accidents through uncontrolled axis movements !

The drive interlock is not for stopping an axis that is in motion.

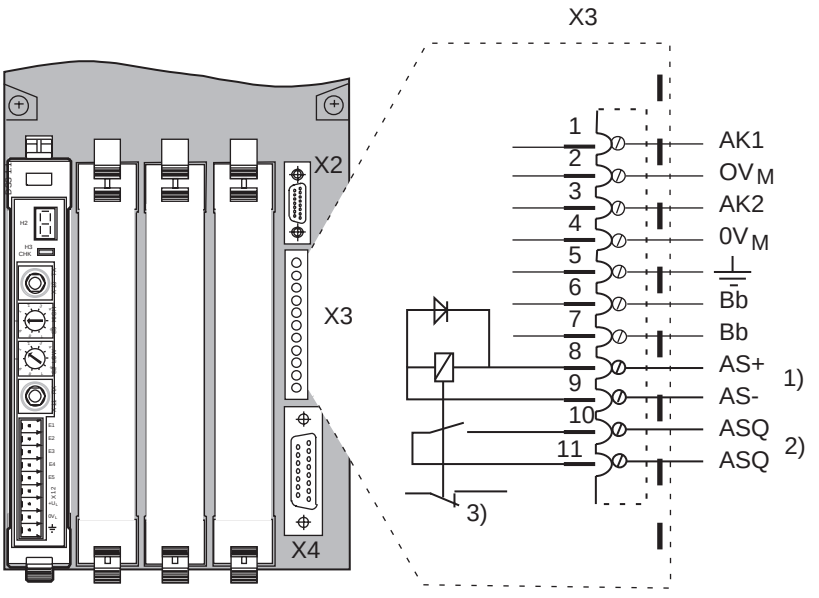
If the drive interlock is activated, the drives cannot be moved with the control system. The motor becomes torque-free instantly, and the axis can no longer be brought to a controlled stop.

With vertical axis, secure the axis with a mechanical brake before activating the drive interlock.

On motors with brakes, this occurs by clearing the drive enable. Only activate the drive interlock after this has been done.

Activating the Drive Interlock

The drive interlock is activated by putting a voltage of +24V on the AS+ and AS- connecting terminals of the X3 connector. The starting lockout relay found in the drive controller is switched by closing the potential-free acknowledgement contact (output ASQ -ASQ) starting at the control system.



1) AS+, AS-, Control input for delay spools
Voltage 20-30V DC
Power 1.5W

2) ASQ, ASQ -potential- free acknowlegement contact
24V, 1A

3) Contact for controlling the power electronics

ap5007d2.fh5

Fig. 7-50: Drive interlock control output and status output on the drive controller

When the drive interlock is activated, the control drive's H1 status display shows the message "AS".

The diagnostic message reads: **A011 Drive Interlock open**

7.7 Drive Error Reaction

The error response depends on the current error class.

If an error is recognized in the drive controller, a preset error response occurs.

This drive error response depends on

- the error class of the current error

and the setting of the parameters

- P-0-0117, NC Reaction on Error
- P-0-0118, Power off on Error
- P-0-0119, Best Possible Deceleration

Note: The error class determines whether the reaction parametrized as above can be done in case of error or not.

There are 4 error classes, which have different priorities.
(see also "Error Classes")

Error Class	Diagnostic Messages	Drive Response
Fatal	F8xx	The error response parameter settings in **P-0-0117, Activation of NC Response During an Error** and **P-0-0119, Best Possible Deceleration** will be ignored, since a driver response is impossible. Torque/force is instantly cut off.
Travel range	F6xx	Independently from the settings in parameters **P-0-0117, NC Reaction on Error** and **P-0-0119, Best possible deceleration**, the velocity command value is immediately set to zero. This response corresponds to the setting P-0-0117 = 0 (no NC Reaction) P-0-0119 = 0 (Velocity Command Value Reset). This setting provides the fastest stop of the axis if the drive range is exceeded.
Interface	F4xx	A response from the control is impossible, since the communication to the control became inoperative. The drive proceeds instantly with **P-0-0119, Best possible Deceleration**.
Non-fatal	F2xx F3xx	The drive conducts the decel procedure set in **P-0-0117, NC reaction on error** and **P-0-0119, Best possible deceleration.** If NC reaction is set as an error response, then the drive continues to operate for 30 seconds after detecting an error, as if no error had been detected. The NC has this time to bring the axis to a controlled standstill. The drive then conducts the response set in P-0-0119.

Fig. 7-51: Error Response of the Drive

Best Possible Deceleration

The drive's response to interface and non-fatal errors can be parameterized by **P-0-0119, Best possible Deceleration** .

At the end of each error response, the drive's torque is cut off.

The following settings are possible:

Value of P-0-0119:	Response
0	Velocity Command Value Reset
1	Torque Disable
2	Velocity command value to zero with command ramp and filter
3	Return motion

Fig. 7-52: Setting options for Best possible Deceleration

The drive response, which is defined as "Best possible Deceleration," controls the response of the drive if

- the drive enable signal changes from 1 to 0 (disable the drive enable)
- the operating mode is switched to parameter mode while the drive is enabled. (Reset of the communication phase)

Velocity Command Value Reset

If 0 is set for "Best Possible Deceleration," the drive will stop the velocity control in case of an error with the command value = 0. The drive stops with its maximum permissible torque/force.

(see also Current Limit)

The proceeding for the motor brake (if mounted) and the enable for the power stage during velocity command value deceleration to zero is displayed in the following picture.

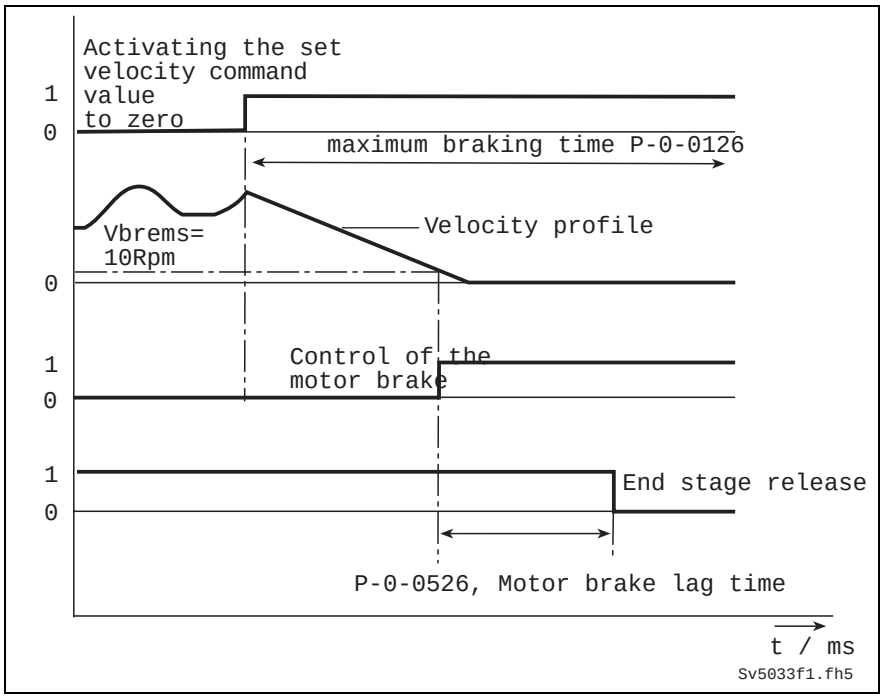


Fig. 7-53: Time sequence of the velocity command value reset

WARNING

If **P-0-0126, Maximum braking time** is set too low:
Danger of damaging the motor brake
⇒ The value for P-0-0126, Maximum braking time always must be set greater than the time needed to decelerate the axis through the velocity command value reset, taking into consideration the max. possible velocity.

If the setting in P-0-0126 is too low, then the error reaction may finish before the axis has stopped. The holding brake will then be activated at a velocity > 0, which, in the long run, leads to damage of the brake.

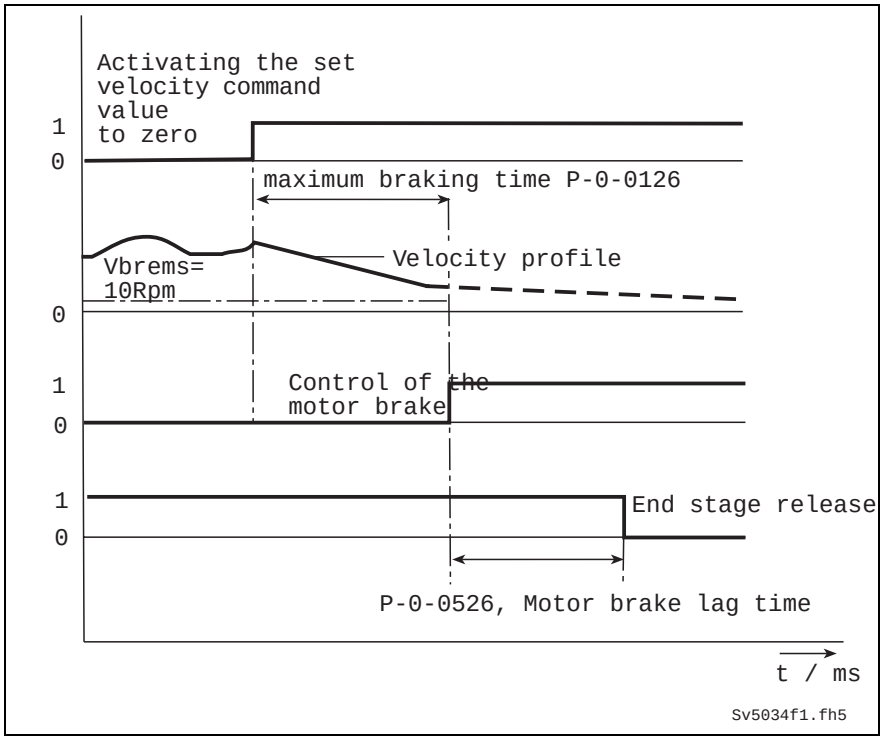


Fig. 7-54: Time sequence of the velocity command value reset, in case of setting the maximum brake time too low

The response "disable torque" is not recommended when a motor has a brake

Disable Torque

If "Best Possible Deceleration" is set to 1, then the drive is set to torque disable in case of an error. The brake will be activated instantly.

WARNING

Disable torque as error response when motor brake is connected

Danger of damaging the motor brake

⇒ Avoid setting this error reaction.

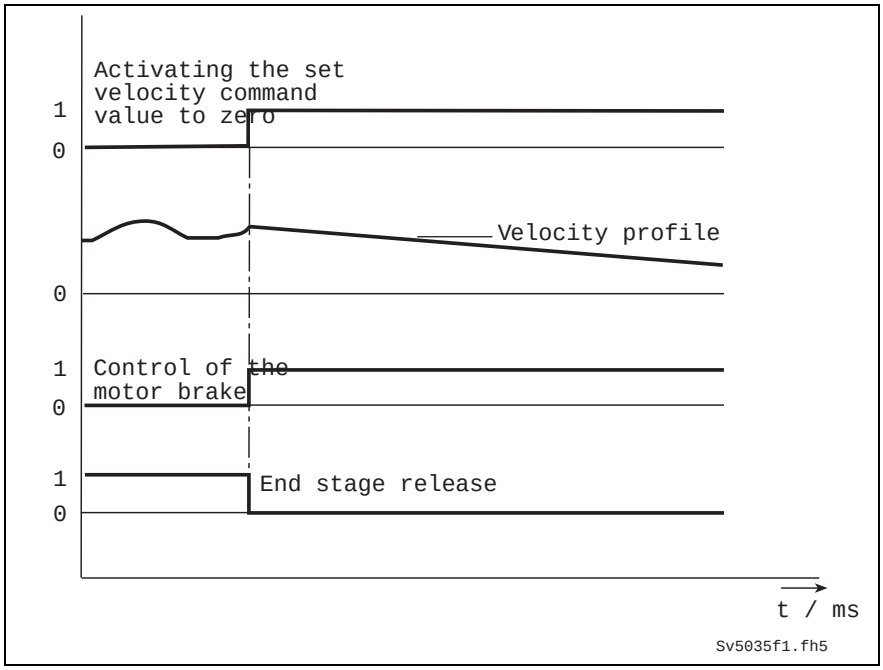


Fig. 7-55: Time sequence of torque disable

Velocity command value reset with filter and slope

If the setting for the "Best possible Deceleration" is 2, the drive will do a deceleration ramp to 0 velocity, if an error occurs. The acceleration or deceleration of the ramp is set with the parameter **P-0-1201, Ramp 1 pitch**. The velocity command passes through a jerk-limiting filter, whose time constant is defined with **P-0-1222, Command Value Smoothing Time Constant**.

The velocity profile is equal to the profile of the velocity control with comparison and filter with a preset value of 0.

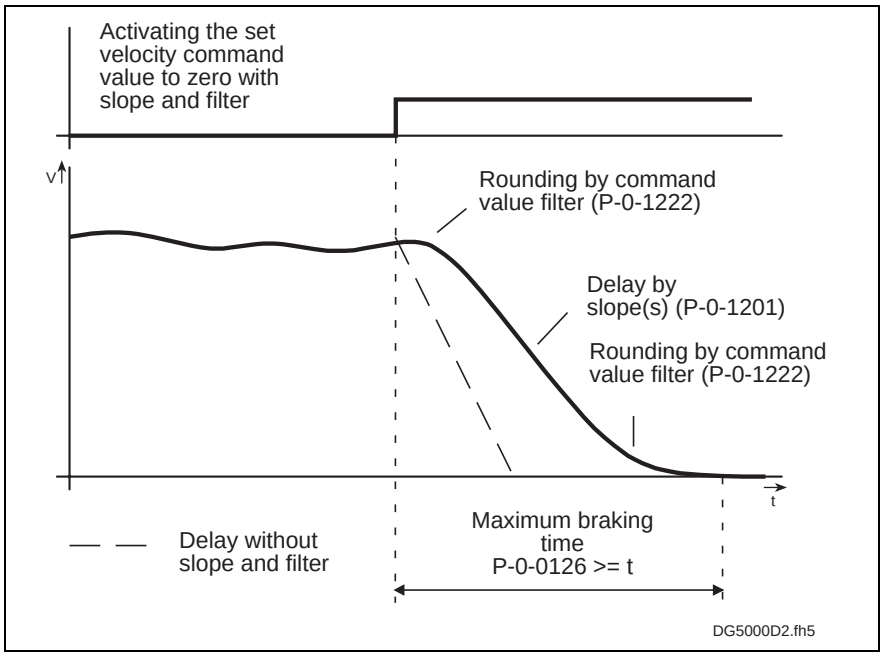

Activating the set velocity command value to zero with slope and filter
v
Rounding by command value filter (P-0-1222)
Delay by slope(s) (P-0-1201)
Rounding by command value filter (P-0-1222)
t
Delay without slope and filter
Maximum braking time P-0-0126 >= t
DG5000D2.fh5

Fig. 7-56: Time sequence of velocity with activated filter

Note: You must ensure that the **P-0-0126, Max. braking time** is greater than the time needed by the drive to decelerate from its max. velocity to v = 0.

Example: Vmax = 1000 Rev/min

ramp deceleration = 100 rad/s²

Time from 1000 Rpm to 0 Rpm =

$$\frac{\frac{1000}{60}\left[\mathrm{Rev}/\mathrm{s}\right] \times 2 \times \pi\left[\mathrm{rad}/\mathrm{Rev}\right]}{100\left[\mathrm{rad}/\mathrm{s}^2\right]} = 105\mathrm{s}$$

For the max. braking time in the previous example, we would propose 1.5s.

The time sequence of the control for the motor brake (if mounted) and the enable for the power stage is the same as for the velocity command reset.

(See also "Velocity Command Value Reset".)

Return motion

If a 3 has been set for "Best possible Deceleration" as a return motion, then the drive generates a position command profile to complete the desired travel distance in the case of an error. In other words, in the case of an error a specific process (travel) block is activated.

This travel block is defined by the parameters

- **P-0-0096, Distance to move in error situation**
- **S-0-0091, Bipolar velocity limit value**
- **S-0-0138, Acceleration bipolar**
- **S-0-0349, Jerk limit bipolar**

Once the drive has covered the distance, i.e., has reached the desired target position, then the motor holding brake is activated (if mounted) and the drive is switched torque free at the end of the motor brake delay time. The distance to move is considered as completed, i.e., the motor holding brake is activated, if

- target position = active position command value, i.e., bit 12 in **S-0-0013, class 3 diagnostics** = 1 and
- Vactual = 0, i.e., bit 1 in **S-0-0013, class 3 diagnostics** = 1 (feedback velocity smaller than **S-0-0124, Standstill window**).

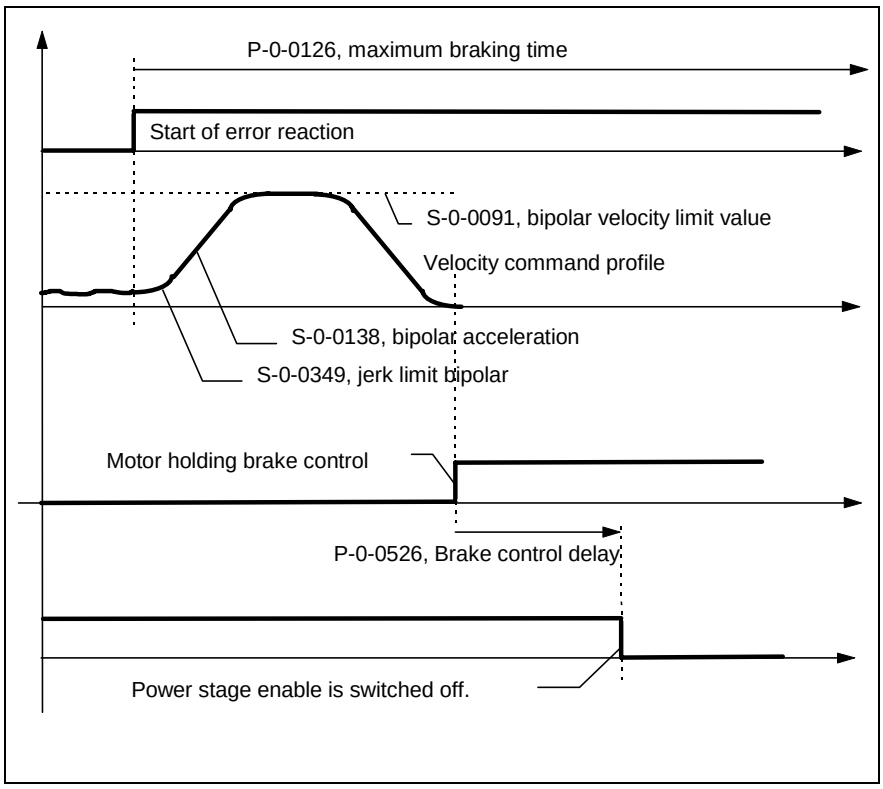

P-0-0126, maximum braking time
Start of error reaction
S-0-0091, bipolar velocity limit value
Velocity command profile
S-0-0138, bipolar acceleration
S-0-0349, jerk limit bipolar
Motor holding brake control
P-0-0526, Brake control delay
Power stage enable is switched off.

Fig. 1-1: Time sequence of the error reaction "return motion“

Error reaction "Return motion" with position limit values activated

If the drive-internal position limit values (**S-0-0049, positive position limit value and S-0-0050, negative position limit value**) have been activated, in other words,

- in **S-0-0055, position polarity parameter** bit 4 for "activating the position limit value" has been set to 1 and
- the encoder set in **S-0-0147, homing parameter, bit 3** is in reference (**S-0-0403, position status** = 1),

then the drive will not leave the travel range set when executing the error reaction "return motion". If the drive is in a position that would take it outside of the position limit values when executing a return motion, then the drive will, in this case, move to a position just in front of the relevant position limit value (precisely by **S-0-0057, Positioning window** in front of the position limit value.

Power Supply Shutdown in Error Situation

In the case of modular units, via a signal line of the control voltage bus, the power supply unit can be informed as to whether the drive has detected an error that should lead to powering down. If the power supply unit receives such a message, then it shuts the DC bus voltage off. All other drives connected to the same power supply module also conduct the drive reaction as set in **P-0-0119, Best possible standstill**. This signalling of a drive error to the power supply unit can be set in the parameter **P-0-0118, Power off on error**.

Structure of the parameter:

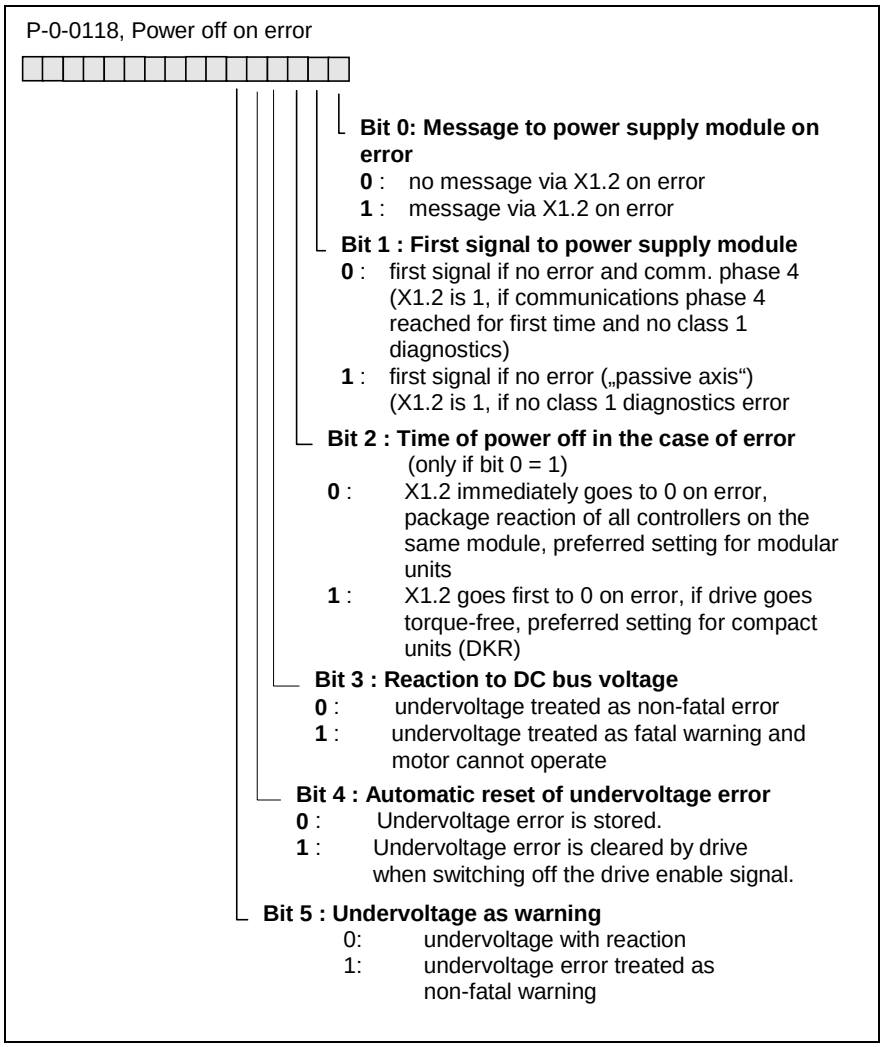

P-0-0118, Power off on error
Bit 0: Message to power supply module on error
0 : no message via X1.2 on error
1 : message via X1.2 on error
Bit 1 : First signal to power supply module
0 : first signal if no error and comm. phase 4 (X1.2 is 1, if communications phase 4 reached for first time and no class 1 diagnostics)
1 : first signal if no error („passive axis“) (X1.2 is 1, if no class 1 diagnostics error
Bit 2 : Time of power off in the case of error
(only if bit 0 = 1)
0 : X1.2 immediately goes to 0 on error, package reaction of all controllers on the same module, preferred setting for modular units
1 : X1.2 goes first to 0 on error, if drive goes torque-free, preferred setting for compact units (DKR)
Bit 3 : Reaction to DC bus voltage
0 : undervoltage treated as non-fatal error
1 : undervoltage treated as fatal warning and motor cannot operate
Bit 4 : Automatic reset of undervoltage error
0 : Undervoltage error is stored.
1 : Undervoltage error is cleared by drive when switching off the drive enable signal.
Bit 5 : Undervoltage as warning
0: undervoltage with reaction
1: undervoltage error treated as non-fatal warning

Fig. 7-57: P-0-0118, Power off on error

Units with extrinsic power supplies are signalled through connector X1, pin 2. If power off on error has been set, then bit 2 of compact units should be set to 1. The error message of the drive causes a mains separation meaning that the energy generated during braking cannot be fed back into the mains. Without a braking resistor (bleeder), the drives then coast to a standstill.

Using bit 1 of P-0-0118 it is possible to set when the error message from the drive to the power supply unit can be removed for the first time. If this bit is 1, then immediately after the basic initialization of the drive, the error reaction is removed and powering up thus becomes possible already in communications phase 0. If bit 1 = 0, then the drive must be in

communications phase 4 and error free before the error message to the power supply unit can be removed for the first time.

Reaction to undervoltage

Bits 3 , 4 and 5 of parameter P-0-0118 offer the options on how to handle the undervoltage. Undervoltage happens when the drive is enabled (with torque) and signal for the DC bus voltage goes down.

With **bit 3 = 1**, undervoltage can be treated as a "fatal warning". This makes sense if the energy in the DC bus must be retained for that period of time which a control needs to start the synchronized deceleration of several drives. The drive, in this case, does not signal a class 1 diagnostics error, and the reaction parametrized in **P-0-0119, best possible standstill** is not executed. Shutting the motor off brings about a slower drop in the DC bus voltage. This means that asynchronous motors can still retain a magnetic field once the control begins to bring the drives to a synchronized standstill. Braking takes place in generator mode.

If the undervoltage is treated as an error (bit 3, 5 = 0), then bit 4 can be used to set whether the error automatically clears itself once the control switches off the drive enable. This makes sense if the error also occurs during the course of a normal shutdown caused by the fact that the control does not clear the enable quickly enough.

With **bit 5 = 1**, you can suppress any reaction to the state of undervoltage. In this case, **only** a **warning** is generated.

NC Response in Error Situation

NC response during an error situation is only possible during non-fatal errors. Otherwise the drive reacts immediately with an error response.

If the drive control device recognizes an error, it sends a message to the control (CNC) . The control can then decelerate the servo axis of the machine without possible damage.

If this is desired, you have to delay the drive error reaction to allow the axis to continue movement to the values set by the control. This is achived by setting the time delay between the recognition of the error and the drive's error reaction. This can be set in parameter **P-0-0117, NC Reaction on Error**.

The following applies:

Value of P-0-0117	Function
0	Drive proceeds the error reaction immediately after recognition of the error.
1	Drive continues for 30 sec in the selected operating mode, then follows the "best possible deceleration".

Fig. 7-58: NC Reaction on Error

Note: Activating the "NC Reaction on Error" is only recommended for controls that have a corresponding error reaction procedure.

Emergency stop feature

The emergency stop feature is used to shutdown the drive through a hardware input on the drive controller. Parameter **P-0-0008, Activation E-stop function** is used to set this function**.**

After activation of the E-Stop Input (bit 0 = 1), the drive is prompted to perform the selected procedure to shutdown the drive. This reaction at first depends on bit 2 of P-0-0008.

If the interpretation "fatal warning" has been parametrized there (bit 2 = 1), then the drive responds as with switching off the external drive enable with the reaction parametrized in **P-0-0119, Best possible standstill**. The warning diagnosis **E834 Emergency-Stop** appears. Bit 15 is set in **S-0-0012, Class 2 diagnostics** (manufacturer specific warning). Simultaneously, the bit "change bit class 2 diagnostics“ is set in the drive status word. This change bit is cleared by reading **S-0-0012, Class 2 diagnostics.** Using parameter **S-0-0097, Mask class 2 diagnostic,** warnings can be masked in terms of their effects on the change bits. The functional principle at work when actuating the E-Stop input is that of a series connection to an external drive enable. In other words, when activating the E-Stop input, the drive responds as if the external drive enable had been switched off.

To **re-activate the drive**, the E-Stop input must become inactive, and another **0-1 edge** must be applied to the external **drive enable**.

If bit 2 has been set to treat it as an error, then the reaction selected in bit 1 is performed. The error diagnosis **F434 Emergency-Stop** (or **F634 Emergency-Stop**), E-stop activated appears, and bit 15 is set in parameter **S-0-0011, class 1 diagnostics** . Bit 13 is set in the drive status word of the drive telegram, i.e., drive interlock, error with class 1 diagnostics is set. The error can be cleared via command **S-0-0099, Reset class 1 diagnostics, or** key S1 on the drive controller if the E-stop input is no longer activated.

This function basically works as if an error had occurred in the drive. The drive reaction is immediate and without delay, independent of parameter **P-0-0117, NC reaction on error.**

If bit 1 = 0, the drive shuts down according **to P-0-0119, Best possible Deceleration**. The diagnosis upon activating the E-stop input then reads **F434 Emergency-Stop.**

If bit 1 is set to 1 , then the drive is braked at maximum torque, if an E-Stop of the drive is triggered, until the speed = 0, regardless of the error reaction set in parameter P-0-0119. This corresponds to the best possible standstill "Velocity command value to zero". The diagnosis with the activation of the E-Stop input then reads **F434 Emergency-Stop.**

Activation and Polarity of the E-Stop Input

For the activation of the E-Stop input and the selection of a response for shutdown of the drive, use parameter **P-0-0008, Activation of the E-Stop-Function**.

The following applies:

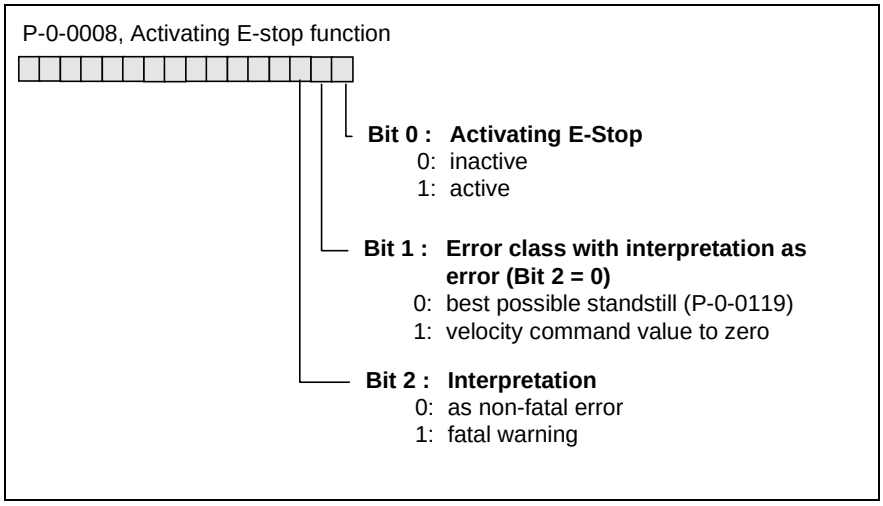

P-0-0008, Activating E-stop function
Bit 0 : Activating E-Stop
0: inactive
1: active
Bit 1 : Error class with interpretation as error (Bit 2 = 0)
0: best possible standstill (P-0-0119)
1: velocity command value to zero
Bit 2 : Interpretation
0: as non-fatal error
1: fatal warning

Fig. 7-59: P-0-0008, Activation of E-Stop-Function

The input polarity cannot be selected. It is always 0-active; i.e., 0 V on E6 of the connector means the E-Stop is active.

If the evaluation of the E-Stop signal is activated, the monitoring of +UL (external +24 V) is also activated, if it has not yet been active.

Connection of the Emergency-Stop Input

The drive controllers are provided with a binary input for the emergency-stop signal. You can find it on the plug-in module DSS 2.1. The input is galvanically separated and has to be supplied through the same connector (X 12) with +24 V.

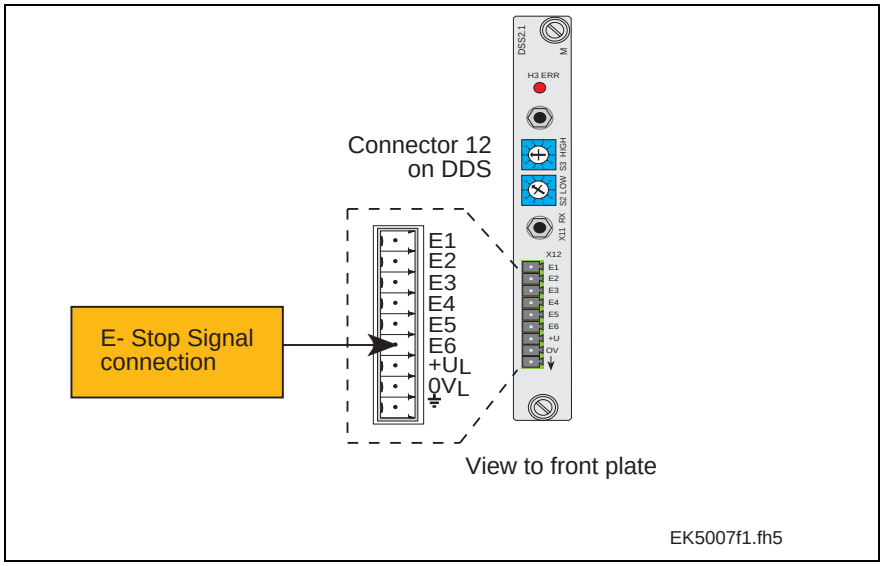


Fig. 7-60: Connection of E-Stop-Signal to X12

If the emergency stop input was activated but the 24 V supply failed, then the error **F273 Error power supply E-Stop** is generated.

7.8 Control Loop Settings

General Information for Control Loop Settings

The control loop settings in a digital drive controller are important for the characteristics of the servo axis. Determining the control loop settings requires expert knowledge.

"Optimizing" the regulator settings is generally not necessary!

For this reason, application-specific control parameters are available for all digital INDRAMAT drives. These parameters can be retrieved from the motor data sheet. They are activated with the Command basic load. (See also Load Default Feature)

In some exceptions, however, it may be necessary to adjust the control loop settings for a specific application. The following section gives a few simple but important basic rules for setting the control loop parameters in such cases.

In every case, the given methods should only be seen as guidelines that lead to a robust control setting. Specific aspects of some applications may require settings that deviate from these guidelines.

The control loop structure is made up of a cascaded (nested) **position, velocity and torque/force loop**. Depending on the operating mode, only the torque control loop or the torque and velocity control loops can become operative. The control is structured as depicted below:

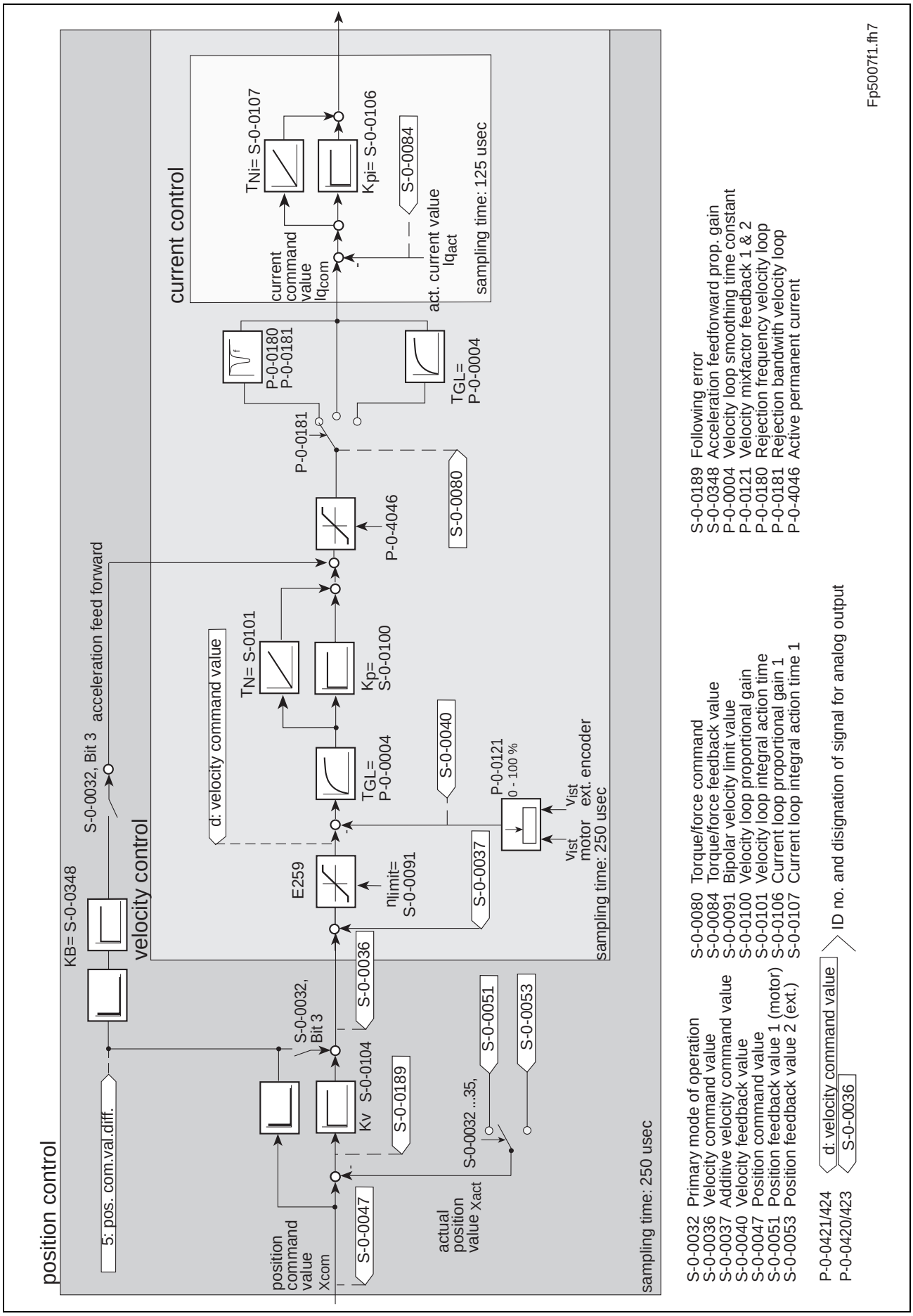


Fig. 7-61: Control structure

Load Default

With the command **Basic Load**, you can activate the default control parameters for motor types with **motor feedback data memory** such as

- MDD
- MKD/MKE

With these parameters, the relevant control parameters for the appropriate motor type used can be set. The parameters are pre-defined by the manufacturer for the moment of inertia relationship of $J_{own} = J_{load}$.

Most applications can work with these values.

Default values can be set for the following parameters:

- **S-0-0106, Current Loop Proportional Gain**
- **S-0-0107, Current Loop Integral Action Time**
- **S-0-0100, Velocity Loop Proportional Gain**
- **S-0-0101, Velocity Loop Integral Action Time**
- **P-0-0004, Smoothing Time Constant**
- **S-0-0104, Position Loop Kv Factor**
- **P-0-0180, Rejection frequency velocity loop**
- **P-0-0181, Rejection bandwidth velocity loop**

The feature **Load Default Settings** can be activated in two different ways:

- Automatic activation during the command procedure **S-0-0128, C200 Communication phase 4 transition check** for the first operation of this motor type with this drive.
- With the command procedure **S-0-0262, C700 Basic Load**

Automatic Execution of the Load Default Feature

The drive recognizes a motor type the first time the drive is used. The drive compares parameter **S-0-0141, Motor type** while processing the command **S-0-0128, C200 Communication Phase 4 Transition Check**. If these parameters are different, then the message **F208 UL The motor type has changed.** is generated. The message "UL" appears on the seven-segment display.

The user can save the current drive parameters before resetting the error to start the load default process.

Error **F208 UL The motor type has changed** can be reset in two different ways:

1) Run the command **S-0-0099, Reset Class 1 Diagnostics** or

2) press the S1 key.

In either case, the command Basic Load is activated.

If the default settings cannot be activated, then the relevant command error messages appear.

(See also "Error Conditions of the Load Default Settings Procedure)"

Run the Load Default Settings feature as a command

With parameter **S-0-0262, C700 Basic load**, the feature can be run as a command. This might be useful if manually changed control parameters are to be set back to the default values.

This command cannot be run when the control enable signal is applied.

Error Conditions of the Load Default Settings Procedure

If the feature started by running the command **S-0-0262, C700 Basic load** is not successfully processed, then the reason for this error is displayed either on the 7-segment display or with the diagnostic parameter **S-0-0095**.

The following could cause an error during basic load:

SS Display	Diagnostic Message:	Cause:
C701	Basic load (= load defaults) not possible if drive is enabled	At the start of the command, the controller enable is set, which is not allowed
C702	Default parameters not available	Basic load (or load defaults) is impossible for the motor type selected, only for MDD-, MKD and MKE
C703	Default parameters invalid	Connection of drive to motor encoder data memory is interrupted or feedback is defective
C704	Parameters not copyable	The existing default value cannot be processed since, for example, the extreme value limit was exceeded in the default value
C705	Locked with password	A customer password has been set which locks out changes to parameters

Fig. 7-62: Possible errors during Basic Load command

If an error occurs during this procedure, then the default values for the indicated invalid parameters can be set. This serves safety purposes and helps in diagnosing additional errors.

Setting the Current Controller

The parameters for the current loop are set by INDRAMAT and cannot be adjusted for specific applications. The parameter values set at the factory are activated with the command **S-0-0262, C700 Command basic load** for MKD/MDD motors or must be retrieved from the motor data sheet.

The parameters for the current controller are set via the parameters

- **S-0-0106, Current loop proportional gain**
- **S-0-0107, Current Loop Integral Action Time**

Warning

Changing the values defined by INDRAMAT
can result in damages to the motor and the drive controller.
⇒ Changes to the current controller parameters are not permitted.

Setting the Velocity Controller

Pre-requisites:

The current control must be correctly set.

The velocity controller is set via the parameters

- **S-0-0100, Velocity Loop Proportional Gain**
- **S-0-0101, Velocity Loop Integral Action Time**
- **P-0-0004, Smoothing Time Constant**

as well as the parameters

- **P-0-0180, Rejection frequency velocity loop**
- **P-0-0181, Rejection bandwidth velocity loop**

These can be set either by running once the load default feature or by following the procedure hereafter.

Preparations for Setting the Velocity Controller

A number of preparations must be made in order to be able to set the velocity loop (controller):

- The mechanical system must be set up in its final form in order to have original conditions while setting the parameters.
- The drive controller must be properly connected as described in the user manual.
- The safety limit switches must be checked for correct operation (if available)
- The velocity control operating mode must be selected in the drive.

The controller setting must be selected for the start of parameterization as follows:

S-0-0100, Velocity Loop Proportional Gain = default value of the connected motor.

S-0-0101, Velocity Loop Integral Action Time = 6500 ms

P-0-0004, Smoothing Time Constant = Minimum value (250 µs)

P-0-0181, Rejection bandwidth velocity loop = 0 Hz

Note: When determining the velocity control parameters, no compensation function should be active.

Definition of the Critical Proportional Gain and P-0-0004, Smoothing Time Constant

- After turning on the controller enable, let the drive move at a low velocity. Rotational motors: 10...20RPM, linear-Motors: 1...2 m/min)
- **Raise the S-0-0100, Velocity loop-proportional gain** until unstable behavior (continuous oscillation) begins.
- Determined the frequency of the oscillation by oscilloscoping the actual velocity (see also "Analog Output"). If the frequency of the oscillation is much higher than 500Hz, raise the **P-0-0004, Smoothing Time Constant** until the oscillation ends. After this, increase the **S-0-0100, Velocity Control Proportional Gain** until it becomes unstable again.
- **Reduce the S-0-0100, Velocity loop proportional gain** until the oscillation ends by itself.

The value found using this process is called the "critical velocity loop proportional gain".

Determining the Critical Integral Action Time

- **Set S-0-0100, Velocity Loop Proportional Gain** = 0.5 x critical proportional gain
- **Lower S-0-0101, Velocity controller integral action time** until unstable behavior results.
- **Raise S-0-0101, Velocity controller integral action time** until continuous oscillation vanishes.

The value found using this process is called the "Critical Integral Action Time."

Determining the Velocity Controller Setting

The critical values determined before can be used to derive a control setting with the following features:

- Independent from changes to the axis since there is a large enough safety margin to the stability boundaries.
- Safe reproduction of the characteristics in series production machines.

The following table shows many of the most frequently used application types and the corresponding control loop settings.

Application Type:	Velocity controller proportional gain	Velocity loop Integral Action Time:	Comments:
Feed axis on standard tool machine	Kp = 0.5 • Kpcrit	Tn = 2 • Tncrit	Good stiffness and good command response
Feed axis on perforating press or chip-cutter machines	Kp = 0.8 • Kpcrit	Tn = 0	High proportional gain; no I-part, to achieve shorter transient periods.
Feed drive for flying cutting devices	Kp = 0.5 • Kpcrit	Tn = 0	Relatively undynamic control setting without I-part, to avoid structural tension between the part to cut off and the machine.

Fig. 7-63: Identification of Velocity Controller Settings

See also Supplement B, Diagnostic Explanations: **F878 Velocity loop error**.

Filtering oscillations from mechanical resonance

DIAX drives are able to suppress oscillations caused by the drive train (gear) between the motor and the axis or by the spindle mechanics even in a narrow band. Thus, an increased drive dynamics with good stability can be achieved.

The mechanical system of rotor-drive train-load is induced to generate mechanical oscillations as a result of position/velocity feedback in a closed control loop. This behavior identified as a "two mass oscillator" is generally within the 400 to 800 Hz range, depending on the rigidity (or elasticity) and spatial volume of the mechanical system.

This "two mass oscillation" usually has a clear resonance frequency which can be specifically suppressed by a notch filter (band suppressor) provided in the drive.

By suppressing the rejection frequency the dynamics of the velocity and position control loops in terms of control can be significantly improved compared to without a band suppression filter.

This results in greater contour accuracy and smaller cycle times for positioning processes, leaving sufficient stability margin.

The rejection frequency and bandwidth can be set. The rejection frequency is the one with highest attentuation, the bandwidth determines the frequency range, at whose borders the attenuation is 3dB less. Greater bandwidth leads to smaller band attenuation of the center frequency!

The following parameters can be used to set both:

- **P-0-0180, Rejection frequency velocity loop**
- **P-0-0181, Rejection bandwidth velocity loop**

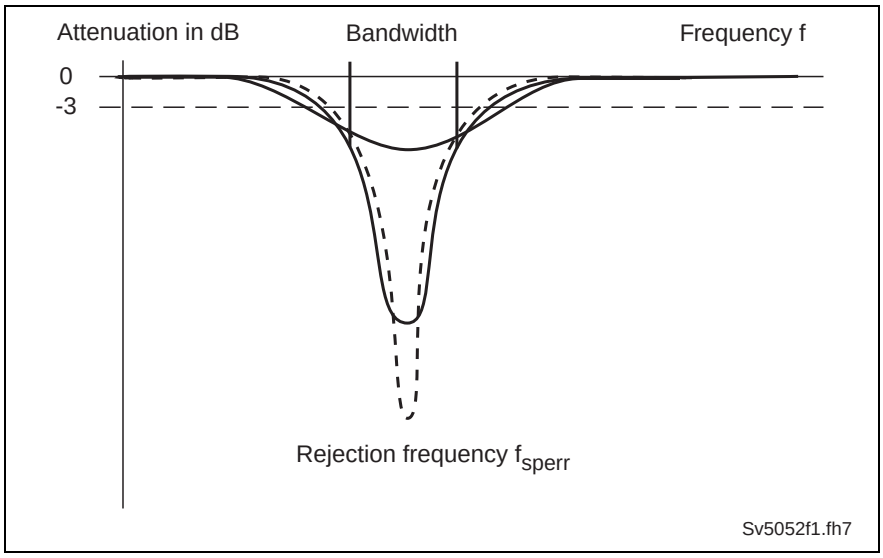


Fig. 7.64: Amplitude response of the rejection filter in terms of bandwidth - qualitative

To set the band filter, we recommend the procedure described as follows:

Pre-settings

⇒ Set rejection filter inactive. Set 0 in parameter **P-0-0181 Rejection bandwidth velocity loop.**

Determing resonance frequency

⇒ Connect oscilloscope to analog output channels. Assign velocity feedback value to analog output 1 (in **P-0-0420, Analog output 1, signal selection** "S-0-0040" and in **P-0-0422, Analog output 1 scaling** enter the scaling, e.g., 100 Rpm / 10 Volts.

- or -

⇒ Use the oscilloscope function of the drive to display velocity feedback value.

⇒ Excite the drive mechanics, e.g., tap lightly with a rubber hammer.

⇒ Record the time of the velocity oscillations with an oscilloscope or oscilloscope function and analyze the clearly salient frequencies. If the oscilloscope function is used, then the resonance frequency can be directly read out of the frequency readout.

Determining the initial state of the loop

⇒ Set the drive enable signal and optimize the velocity loop with inactive rejection filter (see "Setting the Velocity Controller").

⇒ Record step response of the velocity feedback and the torque/force generating command current with a small velocity command step. (The torque-generating command current may not enter the limit during this process.)

Turn rejection filter on and check the effect

⇒ Enter the most salient frequency in Hz in parameter **P-0-0180, Rejection frequency velocity loop.**

⇒ Enter a minimum bandwidth in parameter **P-0-0181, Rejection bandwidth velocity loop,** e.g., 25 Hz.

⇒ Record the previous step response again.

If the step response features less overshoot and shorter periods of oscillation, then:

⇒ Check whether increasing the value of **P-0-0181, Rejection bandwidth velocity loop** causes an improvement

- or -

⇒ check whether a change in the value of **P-0-0180, Rejection frequency velocity loop** means an improvement.

If the step response results in the same behavior, then:

⇒ Check the resonance frequency analysis

- or -

⇒ clearly increase the value in **P-0-0181, Rejection bandwidth velocity loop.**

Optimize rejection filter or velocity loop

⇒ with the pre-optimized values of **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop,** optimize the velocity controller again (see above).

The step responses defined above must have a similar appearance with higher values for **S-0-0100 Velocity loop proportional gain** and / or smaller values for **S-0-0101 Velocity loop integral action time.**

An additional optimizing run may be necessary for **P-0-0180 Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop** using the step response (see above).

Optimizing the Notch Filter or the Velocity Controller

⇒ With the pre-optimized values of **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop**, optimize again the velocity controller (as above).

The transient response defined above must have a similar aspect at higher values for **S-0-0100 Velocity loop proportional gain** and/or smaller values for **S-0-0101 Velocity loop integral action time**.

⇒ If necessary, run another optimization for **P-0-0180 Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop** according to the transient response.

Filtering with double smoothing filter

⇒ Optimization of the control loop with a notch filter (band suppression) does not always make the regulation good enough. This happens for example when the closed loop does not have significant resonance frequencies. Activation of a second smoothing filter (with low pass response) can, depending from the case, improve the regulation quality as desired.

⇒ To do this, set the parameter **P-0-0181, Rejection bandwidth velocity loop** to **-1**. The notch filter as well as the assigned parameter **P-0-0180, Rejection frequency velocity loop** are deactivated. Instead of the notch filter, a smoothing filter is activated in the control loop. This uses the same smoothing time constant T_{gl} as the smoothing filter with **P-0-0004 Velocity loop smoothing time constant**. Together with the smoothing filter at the input of the velocity controller, you obtain a low pass filter of 2nd order (2 poles). Frequencies greater than the cutoff frequency $f_g = 1/2\pi T_{gl}$ are much more suppressed and cannot excite oscillations in the control loop any more. The parameter for the filter is **P-0-0004 Velocity loop smoothing time constant**.

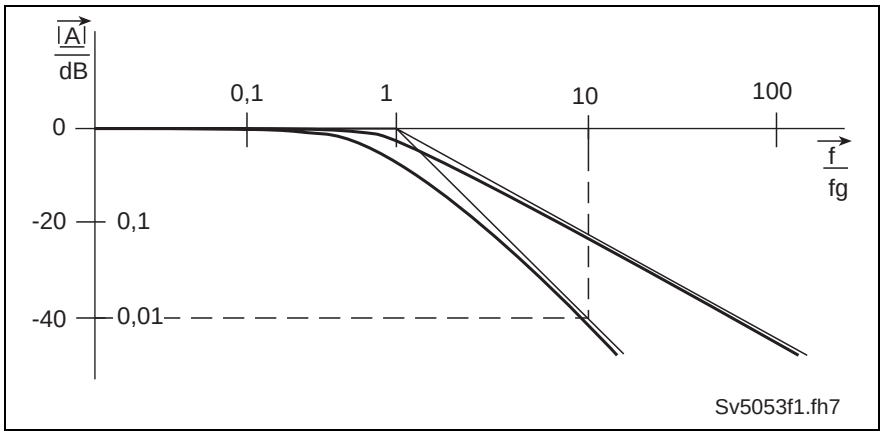


Fig. 7-65: Frequency response of low pass filters with 1 pole and with 2 poles

Note: The adjustment is the same as described under "**Determining the critical proportional Gain and P-0-0004, Velocity loop smoothing time constant**".

Setting the position controller

Pre-requisite:

Current and speed control must be correctly set.

The position controller can be set with the parameter

- **S-0-0104, Position Controller Kv Factor**

This can be set by either executing the load default settings procedure or by following the process below.

Preparations for Setting the Position Control Loop

A number of preparations must be made in order to be able to set the position controller properly:

- The mechanical system must completely assembled and ready for operation.
- The drive controller must be properly connected as described in the user manual.
- The safety limit switches must be checked for correct operation (if available)
- The position control operating mode must be selected in the drive.
- The velocity controller must be properly tuned. The start value chosen for the K_v-factor should be relatively small ($K_v = 1$).
- For the determination of the position controller parameter, no compensation function should be activated.

Determing the Critical Position Controller Gain

- Operate the drive in a mode that closes the position loop in the drive.
- Move axis at a slow velocity, i.e., with a jog function at a connected NC Control (Rotating Motors: 10...20 Rpm, linear-Motors: 1...2m/min).
- Raise the K_V-factor until instability appears.
- Reduce the Kv-factor until the continuous oscillation ends by itself.

The Kv factor determined through this process is the "Critical position control loop gain".

Determining the Position Controller Setting

In most applications, an appropriate position controller setting will lie between 50% and 80% of the critical position controller loop gain.

This means: **S-0-0104, Position Loop KV-Factor** = 0.5..0.8 • Kvcrit

Position Control Loop Monitoring

The position control loop monitor helps to diagnose errors in the position control loop.

Reasons for errors in the position control loop can be:

- Exceeding the torque or acceleration capability of the drive.
- Blocking of the axis' mechanical system
- Disruptions in the position encoder

The monitoring of the position circuit is only active when an operation mode with closed position loop is active in the drive. To set and check the monitoring function, two parameters are used:

- **S-0-0159, Monitoring Window**
- **P-0-0098, Max. Model Deviation**

If the drive detects an error in the position control loop, the error message

- **F228 Excessive deviation**

is issued.

General Operating Characteristics of Position Control Loop Monitoring

To monitor the position control loop, a model actual position value is computed, which depends only on the commanded position profile and the set position loop parameters. This model position is compared continuously to the actual position. If the deviation exceeds **S-0-0159, Monitoring Window** for more than 4 ms, an error **F228 Excessive deviation** will be generated.

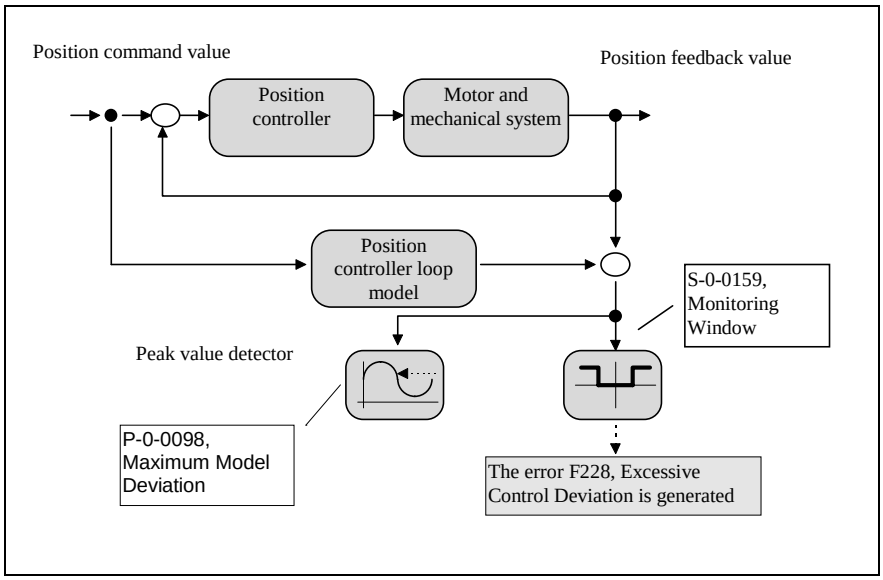


Fig. 7-66: Schematic of Position Control Loop Monitoring

For accurate monitoring, always the actual feedback value from the position control is used. This means that for position control with the motor encoder, position feedback value-1 is used; and for position control with the external encoder, the position feedback value-2 is used.

Setting the Position Control Loop Monitor

Requirements for the setup of the position loop monitoring are

- Check the velocity and position control loops for their appropriate settings.
- The axis in question should be checked mechanically and should be in its final state.

The position control loop monitor settings are performed:

- Through the connected control, you should proceed in a typical operation cycle. In this mode, move at the maximum projected velocity.
- In parameter **P-0-0098, Max. Model Deviation**, the maximum deviation between the actual feedback value and the expected feedback value is always displayed. (Note: The contents of this parameter are not saved. After enabling the drive, this parameter equals zero.)

- This value can be used to help set the monitoring window. Parameter **S-0-0159, Monitoring Window** should be set to **P-0-0098, Max. Model Deviation** multiplied by a safety factor. A safety factor between 1.5 and 2.0 is recommended.

Example:

Content of P-0-0098, Maximum Model Deviation:

0.1 mm

⇒ Determination for the parameter S-0-159, Monitoring Window:

0.2 mm (= 2 x 0.1 mm)

Deactivation of the Position Control Loop Monitoring

It is strongly recommended to activate the position loop monitoring. However, there are exceptions for which the position loop monitoring must be deactivated. You can do that with the parameter **S-0-0159, Monitoring Window**, if it is set to very high values.

Setting the Acceleration Feed Forward

For Servo applications, where high precision at high speeds counts, you have the option to improve by far the precision of an axis during acceleration and brake phases through activation of the acceleration feed forward.

Typical applications for the use of the acceleration feed forward:

- Free form surface milling
- Grinding

To set the acceleration feed forward, use the parameter

- **S-0-0348, Proportional Gain Acceleration Feed Forward**

This value can be determined as follows.

Requirements for a Correct Setting of the Acceleration Feed Forward

- Velocity and position loop have to be set appropriately.
- For the position controller, a **lagless** operation mode must be selected.
- If frictional torque compensation should be activated, you must set this before setting the acceleration feed forward. A reversed procedure can limit the action of the acceleration feed forward.

Setting the Acceleration Feed Forward

Setting the correct acceleration feedforward can only be done by the user since it depends on the inertia.

The setting is done in two steps:

- Calculation of the preset value for the acceleration feedforward. For this purpose, you need the size of the complete inertia momentum translated to the motor shaft ($J_{Motor}+J_{Load}$) of the axis. This value is known approximately from projecting the axis. Additionally, you need the torque constant of the used motor. This data can be retrieved from the motor data sheet or the parameter **P-0-0051, Torque-/Force Constant** Kt. The preset value is calculated as:

$$\text{Acceleration Feedforward} = \frac{J_{Motor} + J_{Actuated}}{Kt} \times 1000$$

Acceleration Feedforward [mA/(rad\s²)]
J*Motor*: Inertia momentum of the motor [kg m²]
J*Load*: Inertia momentum of the load [kg m²]
Kt: Torque constant of the motor [Nm/A]

Fig.7-67: Value for the Acceleration Feedforward

The determined value is entered in parameter **S-0-0348, Acceleration Feedforward prop. Gain**.

Checking the effect of the acceleration feedforward and, if necessary, **fine tuning** of the parameter **S-0-0348, Acceleration Feedforward prop. Gain**:

The deviation of the actual feedback value to the position command can be displayed through the analog diagnostic output of the drive controller. To check the effect of the acceleration feed forward, you must oscilloscope the signal during movement of the axis along the desired operation cycle. In acceleration and brake phases, the feedforward must reduce the control deviation drastically.

Setting the Velocity Mix Factor

With the help of the velocity mix factor, you can combine the velocity feedback value, used for velocity control, from the motor and the external measurement system. This might be an advantage, when there is play or torsion between motor and load. To set the mixing ratio, use the parameter

- **P-0-0121, Velocity Mixfactor Feedback1 & 2**

Precondition: The function is only applicable when ther is an external measurement system. If this is not available, **P-0-0121** is automatically set to 0 % .

The mixture of the velocity feedback value can be continuously varied between:

- 100% Velocity feedback value of the motor encoder
  /
  0% actual value of the external encoder (P-0-0121 = 0)
  and
- 0% Velocity feedback value of the motor encoder
  /
  100% actual value of the external encoder (P-0-0121 = 100 %)

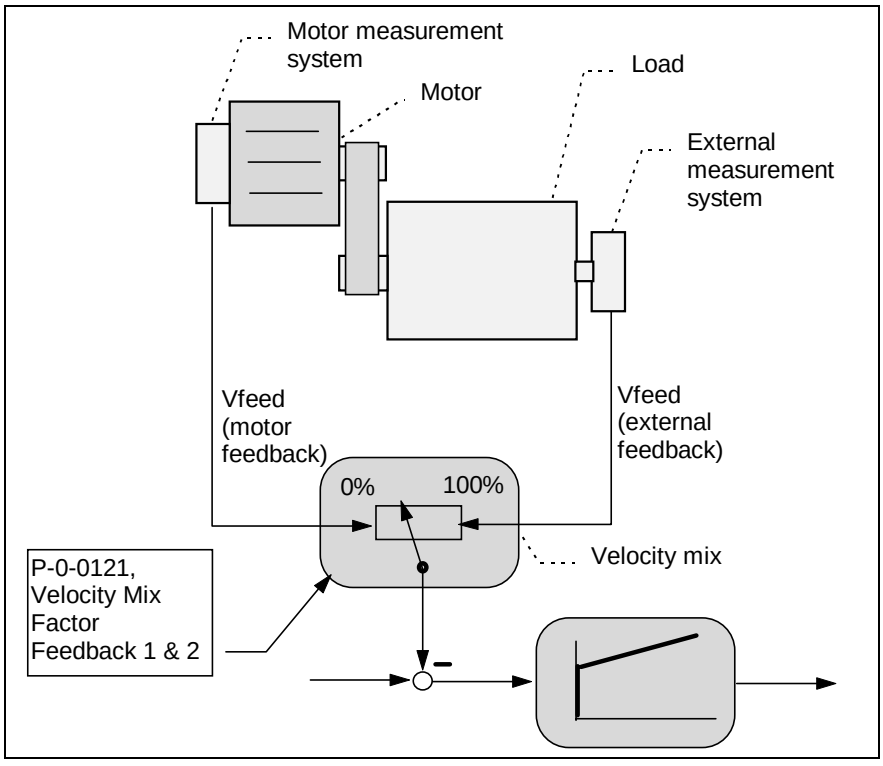


Fig. 7-68: Velocity Mixture Diagram

Setting the Frictional Torque Compensation

The drive-internal frictional torque compensation allows for direction-dependent switching of the torque command value (**S-0-0155, Friction Compensation**). The reason for this is to equalize the frictional torques of the connected mechanical system so that the deviations can be reduced during a directional reverse and so that the exactness of an axis can be increased.

Frictional torque compensation is used in precision tool machines.

Meaningful Use of Frictional Torque Compensation

- The frictional torque of the axis must be a relevant size. If the frictional torque portion is less than 10% of the rated torque of the active drive, then the frictional torque compensation has negligible results.
- The frictional torque to be compensated must remain basically constant independent from the current processing.

Preparation for Setting the Frictional Torque Compensation

- Velocity and position loops must be set according to specification.
- The NC control system must be connected and must allow for the jog feature.
- Travel range limits of the axis must be set and activated.
- If the axis has a temperature-dependent friction characteristic, then the axis must be brought to operating temperature before determining the compensation value.

Determining the Compensation Torque

1. Move the axis in jog mode at the maximum projected operating velocity. During this process, the torque command should be recorded (read) in the phases of constant velocity.
2. Do this procedure in both movement directions of the axis.
3. The value to be set for the frictional torque compensation should be taken from the values determined above. The following applies:

$$\text{frict. torque compens.} = (|\text{frict. value pos.}| + |\text{frict. value neg.}|) \times 0.5$$

Fig.7-69: Frictional Torque Compensation

7.9 Drive Stop

The drive halt feature serves to stop the axis with defined acceleration and defined jerk.

The feature is activated either through deletion of the /drive_halt bit (bit 13) in the master control word or through interruption of the drive control commands (i.e., drive-controlled homing).

The following parameters are used:

- **S-0-0138, Bipolar Acceleration Value**
- **S-0-0349, Jerk limit bipolar**

For diagnostics, the following parameters

- **S-0-0124, Standstill Window**
- **S-0-0182, Manufacturer Class 3 Diagnostics**

are used.

Drive Halt Feature Description

If in the master control word bit 13 is changed from 1 to 0, then this feature will be activated. The drive no longer follows the command values of the active operating mode, but changes to position control and decelerates the axis with the parameters **S-0-0138, Bipolar Acceleration Value** and **S-0-0349, Jerk limit bipolar**. The LEDs display **AH**, and the diagnostic message in S-0-0095 is **A010 Drive HALT**.

If the actual velocity falls below the value of the parameter **S-0-0124, Standstill Window**, the bit "Drive Halt Confirmation" will be set in **S-0-0182, Manufacturer Class 3 Diagnostics**.

If bit 13 in the master control word is reset to 1, the selected operation mode will be reactivated.

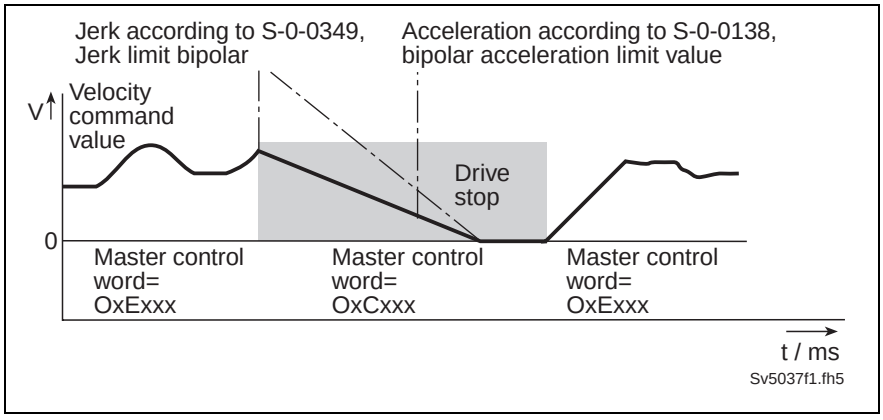


Fig. 7-70: Drive Halt Diagram

The position-controlled deceleration is done with lag, if the previous operating mode was with a lag. In the other case, this feature proceeds without lagless control.

7.10 Drive-Controlled Homing

The position feedback value of the measuring system to be referenced forms a coordinate system. This system does not comply with the machine coordinate system after the drive has been initialized, as long as no absolute encoders are used. To establish congruence between drive (measuring system) and machine coordinate system use the **S-0-0148, C600 drive-controlled homing procedure command**.

Drive-controlled homing means that the drive independently creates the necessary motion, which corresponds to the homing velocity settings and homing acceleration settings.

This feature can be executed for either the motor encoder or the external encoder.

To run this feature, use the following parameters:

- **S-0-0148 C600 Drive-controlled Homing Command**
- **S-0-0147, Homing Parameter**
- **S-0-0298, Reference Cam Shifting**
- **S-0-0299, Home Switch Offset**
- **S-0-0052, Reference Distance 1**
- **S-0-0054, Reference Distance 2**
- **S-0-0150, Reference Offset 1**
- **S-0-0151, Reference Offset 2**
- **S-0-0041, Homing Velocity**
- **S-0-0042, Homing Acceleration**
- **P-0-0153, Optimal Distance Home Switch - Reference Mark**
- **S-0-0177, Absolute distance 1**
- **S-0-0178, Absolute distance 2**
- **S-0-0165, Distance coded reference offset 1**
- **S-0-0166, Distance coded reference offset 2**

The following parameters

- **S-0-0108, Feedrate Override**
- **S-0-0057, Positioning Window**
- **P-0-0099, Position Command Smoothing Time Constant**
- **S-0-0403, Position Feedback Value Status**

also can be used.

Setting the referencing parameters

The basic sequence is dependent on how parameter **S-0-0147, Homing parameter** has been parametrized.

The following settings are performed:

- referencing direction positive/negative
- referencing with motor or external encoder
- evaluation of the home switch yes/no
- evauation of the marker yes/no

The parameter is structured as follows:

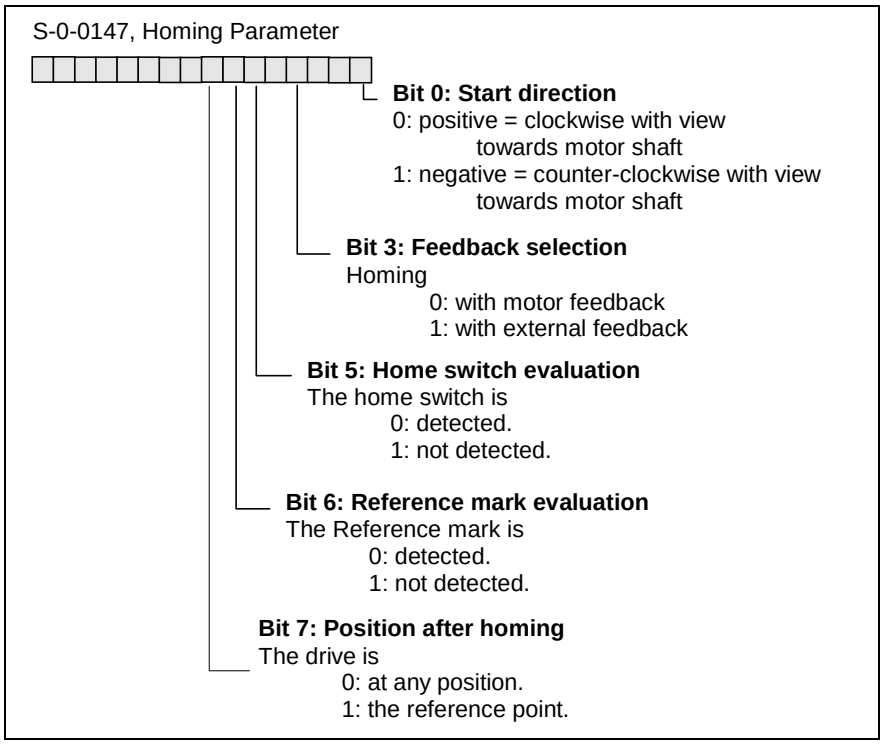

S-0-0147, Homing Parameter
Bit 0: Start direction
0: positive = clockwise with view towards motor shaft
1: negative = counter-clockwise with view towards motor shaft
Bit 3: Feedback selection
Homing
0: with motor feedback
1: with external feedback
Bit 5: Home switch evaluation
The home switch is
0: detected.
1: not detected.
Bit 6: Reference mark evaluation
The Reference mark is
0: detected.
1: not detected.
Bit 7: Position after homing
The drive is
0: at any position.
1: the reference point.

Fig. 7-71: Structure of parameter S-0-0147, Homing parameter

The sequence also depends on the type and arrangement of the reference markers in terms of the referenced encoder. For distance-coded reference marks (type 4), the reference switch is not evaluated, even if this is selected in S-0-0147.

Overview about Type and Configuration of Homing Marks in the Measurement System

For better understanding, you can divide the measurement systems into 4 groups according to the type and configuration of their reference marks.

- **Type 1**: Measurement systems with absolute singleturn range, such as the Singleturn DSF or Resolver. These measurement systems have an absolute range of one encoder revolution or fractions of it (resolver). Typical systems are the encoders for the MDD, MKD and MKE motors and the GDS measurement system.

- **Type 2**: Incremental rotational measurement systems with a reference mark for each encoder rotation, such as the ROD or RON types from the Heidenhain Company.
- **Type 3**: Incremental translation measurement systems with one or several reference marks, such as the LS linear scaling of the Heidenhain Company.
- **Type 4**: Incremental measurement systems with distance coded reference marks, such as the LSxxxC linear scaling of the Heidenhain Company.

The drive-internal detection for the configuration of the reference marks is done with the settings of the corresponding position encoder type parameter **S-0-0277, Position feedback 1 type parameter** (for motor encoder) or **S-0-0115, Position feedback 2 type parameter** (for external encoder).

In these parameters, you set with bit 0 whether it's a rotary or a linear measurement system, and bit 1 decides whether the measurement system has distance-coded reference markers.

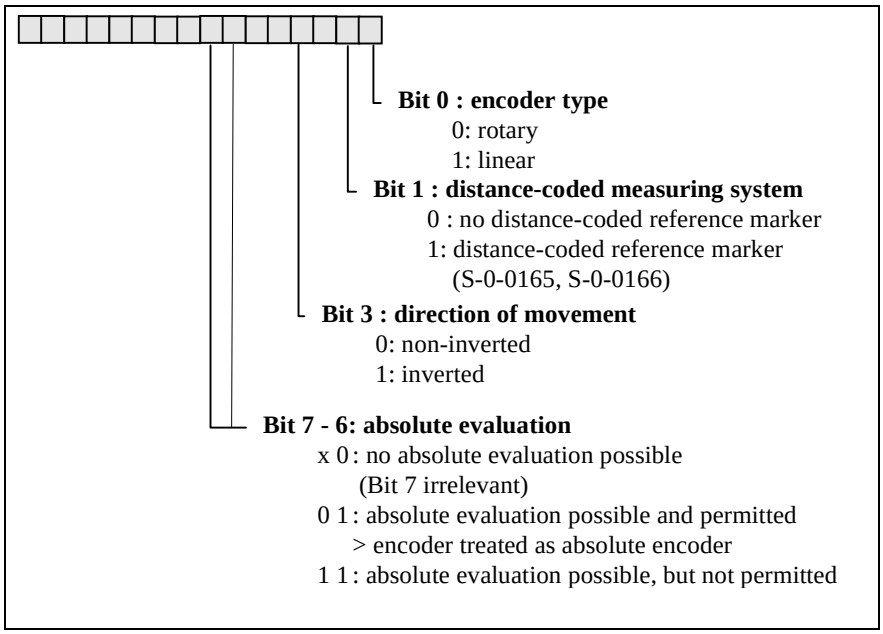

Bit 0 : encoder type
0: rotary
1: linear
Bit 1 : distance-coded measuring system
0 : no distance-coded reference marker
1: distance-coded reference marker
(S-0-0165, S-0-0166)
Bit 3 : direction of movement
0: non-inverted
1: inverted
Bit 7 - 6: absolute evaluation
x 0 : no absolute evaluation possible
(Bit 7 irrelevant)
0 1 : absolute evaluation possible and permitted
> encoder treated as absolute encoder
1 1 : absolute evaluation possible, but not permitted

Fig. 7-72: Structure of the position feedback type parameters S-0-0115 / S-0-0277

For measurement systems with their own data memory (Type 1), this setting is done automatically.

See also "Setting the Measurement System".

Functional principle of drive-controlled referencing

To establish congruency between drive (measuring system) and machine coordinate system it is necessary that the drive has precise information about its relative position within the machine coordinate system. The drive receives this information by detecting the home switch edge and/or the reference mark.

Note: To evaluate only the home switch is not recommended as the position of the home switch edge has a lesser precision compared to the detection of the reference mark!

Coordinate system compensation is achieved by comparing the desired feedback position at a specific point within the machine coordinate system with the actual feedback position ("old" drive coordinate system). A differentiation in this case is made between "Evaluation of a reference mark/home switch edge" (type 1 .. 3) and "Evaluation of distance-coded reference marks".

- With "Evaluation of a reference mark/home switch edge" the "specific" point within the coordinate system is the so-called reference point. The desired feedback position is set at this point via parameter **S-0-0052, Reference distance 1** (for motor encoders) or **S-0-0054, Reference distance 2** (for external encoders). The physical position of the reference point derives from the position of the reference marker plus the value in **S-0-0150, Reference offset 1** or **S-0-0151, Reference offset 2**. Once the reference marker is detected, the drive knows the position of this marker and therefore also that of the reference point in the "old" drive coordinate system. The desired position is in parameter S-0-0052/ S-0-0054.
- With "Evaluation of distance-coded reference marks" the "specific" point is the zero point (position of the first reference mark) of the distance-coded measuring system. By detecting the position difference between two adjacent reference marks the position of the first reference marker in the "old" drive coordinate system can be determined. The desired feedback position at this point is defined by the position of the first reference mark in the machine coordinate system at this point plus the value in **S-0-0177, Absolute distance 1** (for motor encoders) or **S-0-0178, Absolute distance 2** (for external encoders).

In both cases, the difference between both coordinate systems is added to the "old" drive coordinate system. The coordinate systems will then comply.

By switching the position command and feedback value, **S-0-0403, Position feedack value status** is set to 1. This means that the feedback position value now refers to the machine zero point.

Note: If the drive, once the reference command has been conducted, is in parameter mode again, then parameter **S-0-0403, position feedback value status** is set to 0, because the feedback values in command **S-0-0128, C200 Communication phase 4 transition check** are re-initialized.

Sequence control "Drive-Controlled Homing"

The command profile depends on the parameters

- **S-0-0041 Homing velocity ,**
- **S-0-0108 Feed rate override and**
- **S-0-0042 Homing acceleration.**

To limit the acceleration changes, you can additionally activate a jerk limit. You can do this by entering the parameter **P-0-0099, Position command smoothing time constant**.

The following diagram explains this:

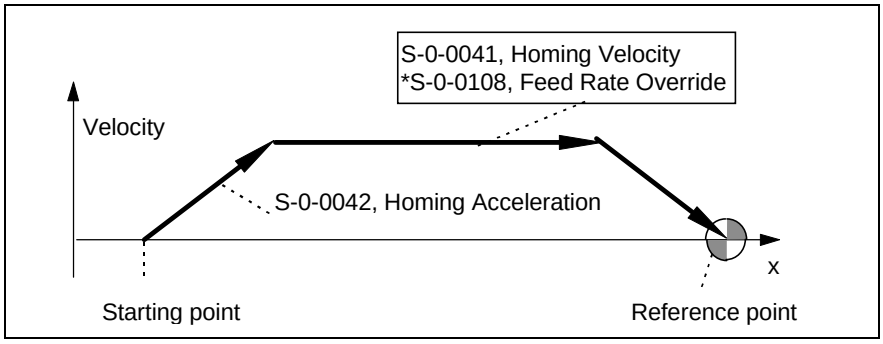


Fig. 7-73: Position command profile with homing velocity and homing acceleration

The maximum velocity is influenced, like with all drive-controlled functions, by the feedrate. The effective maximum velocity is the result of the product of **S-0-0041, Homing velocity** and **S-0-0108, Feedrate-Override**.

If the parameter S-0-0108, Feedrate-Override has been set to zero, the warning **E255 Feedrate-override S-0-0108 = 0** will be displayed.

The motional process during drive-controlled homing can be made up of up to three processes:

- If the home switch evaluation process has been activated and there are no distance-coded reference markers, then the drive accelerates to the homing velocity in the selected homing direction until the positive home switch edge is detected. If the drive is already on the home switch at the start of drive-controlled referencing (**S-0-0400, Home switch** = 1), the drive at first accelerates in the opposite direction until the negative home switch edge is detected, and then reverses the direction.

WARNING

⇒ Make sure that the home switch edge is within the reachable travel range.

- If real reference markers are available (type 2 to 4, see above), and if the reference marker evaluation is activated, then the drive runs in homing direction until it detects a reference marker. In distance-coded measuring systems (type 4), two sequential reference markers must be passed. The reference markers are always evaluated there (independent of bit 6 in S-0-0147).
- The further action depends on how bit 7 has been set in **S-0-0147, Homing parameter**. If 0 is programmed there ("any position after homing"), then the drive brakes with the programmed homing acceleration up to standstill. If the value of the velocity feedback is less than the value set in **S-0-0124, Standstill window**, then the coordinate system of the referenced encoder is set, and the command is signalled as completed. If a 1 is set in bit 7, ("Drive travels to reference point“), then the drive positions to the reference point. The reference point in encoders of the types 1 to 3 is defined by the position of the reference mark plus the relevant reference offset (S-0-0150 / S-0-0151). In the case of distance-coded reference markers, the drive runs to the second detected mark. The coordinate system switch and the completion message of the command are generated as soon as the drive-internal position command has reached the target value and the difference between feedback and target value is less than the value set in **S-0-0057, Position window.**

The following illustrates the sequence for "Drive goes to reference point"

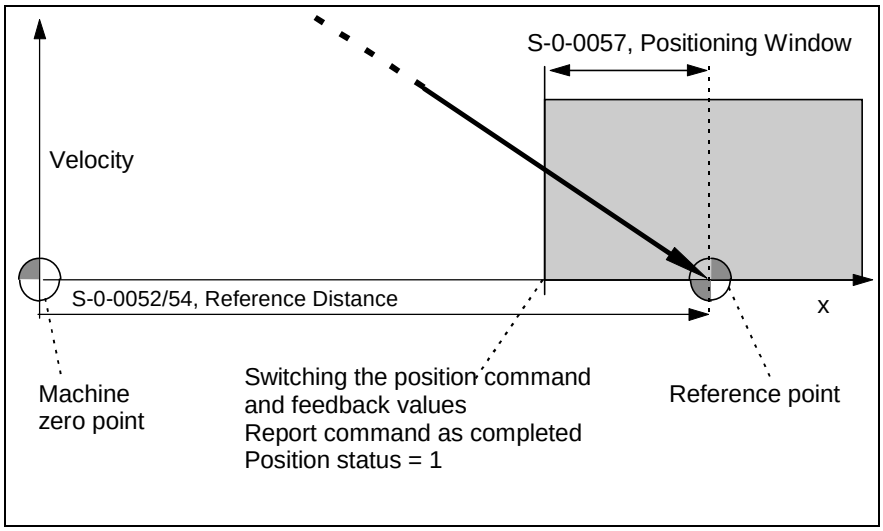


Fig. 7-74: Switching of position command and actual feedback values

Actual Feedback Values After the "Drive-Controlled Homing" Command

The position feedback values from the motor and external encoders, after the drive-controlled homing command is processed, depend on bit 3 in **S-0-0147, Homing Parameter** and on the availability of an absolute encoder as a motor or external encoder.

Motor encoder:	Ext. encoder:	S-0-0147 Bit 3:	Actual feedback value 1:	Actual feedback value 2:
absolute	not absolute	1	unchanged	reference distance 2
not absolute	absolute	0	reference distance 1	unchanged
not absolute	not absolute	0	reference distance 1	reference distance 1
not absolute	not absolute	1	reference distance 2	reference distance 2

Fig. 7-75: Position feedback values after the drive-controlled homing command

Commissioning with "Evaluation of reference marker/home switch edge"

If the encoder does not have distance-coded reference marks (type 1 to 3), then select in **S-0-0147, Homing parameter** whether

- home switch evaluation is desired or not and/or
- reference mark evaluation is desired.

Additionally,

- in which direction the drive should move with the start of the command "Drive-controlled homing" as well as whether
- the drive should go to the reference point or not.

If a home switch evaluation becomes necessary, then the necessary settings must first be made (see "Evaluation of the Home Switch"). All additional steps can then be conducted as follows:

⇒ Check the relevant position encoder type parameter (S-0-0277 / S-0-0115) to make sure it has been correctly set.

⇒ Parametrize **S-0-0052, Reference distance 1** or **S-0-0054, Reference distance 2** as well as parameter **S-0-0150, Reference offset 1** or **S-0-0151, Reference offset 2** with 0.

⇒ Set parameters **S-0-0041, Homing velocity** and **S-0-0042, Homing acceleration** to small values (e.g., S-0-0041 = 10 Rpm, S-0-0042 = 10 rad/s².

⇒ Conduct the drive-controlled homing command.

Note: If the command is cleared, then the original operating mode becomes active. If **drive-internal interpolation** is set, then the drive immediately runs to the value set in **S-0-0258, target position**. This value relates to the new (machine zero point) coordinate system!

The command should be completed without error. The machine zero point is at the position of the home switch or the referencing point as the reference distances (S-0-0052/54) have been parametrized with 0. The position feedback value in **S-0-0051 Position feedback value 1** or **S-0-0053, Position feedback value 2** should now have absolute reference to this preliminary machine zero point.

To set the correct machine zero point, you can now conduct the following steps:

⇒ Run the axis to the desired machine zero point and set the feedback position value displayed there with opposite sign in **S-0-0052, Reference distance 1** or **S-0-0054, Reference distance 2.**

Or:

⇒ Run the axis to position feedback value = 0, measure the distance between the current position and the desired machine zero point. Enter the distance in **S-0-0052, Reference distance 1** or **S-0-0054, Reference distance 2.**

Once the drive-controlled reference command is again completed, the position feedback value should refer to the desired machine zero point.

The reference point can be shifted relatively to the reference mark (see "Consideration of the reference offset").

Parameter **S-0-0041, Homing velocity** and **S-0-0042, Homing acceleration** can now be set to their final values.

Consideration of the Reference Offset

If the evaluation of the reference mark is activated in the homing parameter, then the reference point is always set on the position of the selected reference mark. If a measurement system of type 1..3 is present (not distance-coded), you can shift the position of the reference point relatively to the reference marker. Doing so, you can select any position after homing.

The offset is set with the parameters

- **Reference Offset 1** (for motor encoder)
- **Reference Offset 2** (for external encoder)

If the reference offset is positive, then its drive-internal direction is positive (see "Command Polarities and Actual Value Polarities"). In other words, the reference point is moved in terms of the reference mark in a clockwise direction when looking towards the motor shaft. If the homing direction is also positive, then the drive does not reverse the direction after passing the reference marker.

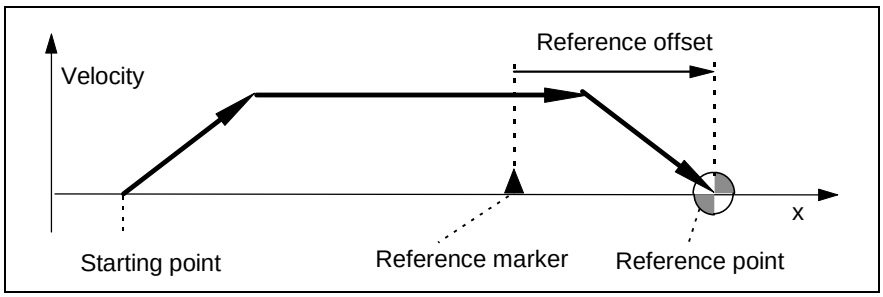


Fig. 7-76: Command value profile for positive reference offset and positive homing direction

If the reference direction is negative, then the drive can reverse the direction (with types 2 and 3) after passing the reference marker.

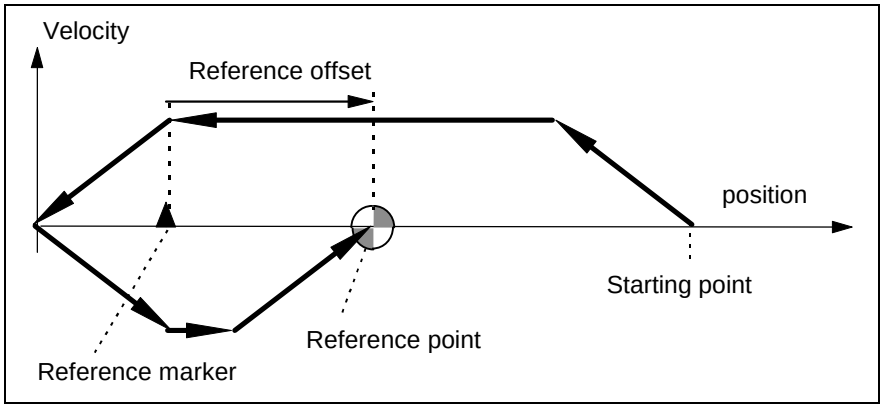


Fig. 7-77: Command profile for positive reference offset and negative homing direction

If the reference offset is negative, then its drive-internal direction is negative (see "Command Polarities and Actual Value Polarities"). In other words, the reference point is shifted counterclockwise looking towards the motor shaft. If the reference direction is negative, then the drive does not reverse the travel direction once it has passed the reference marker.

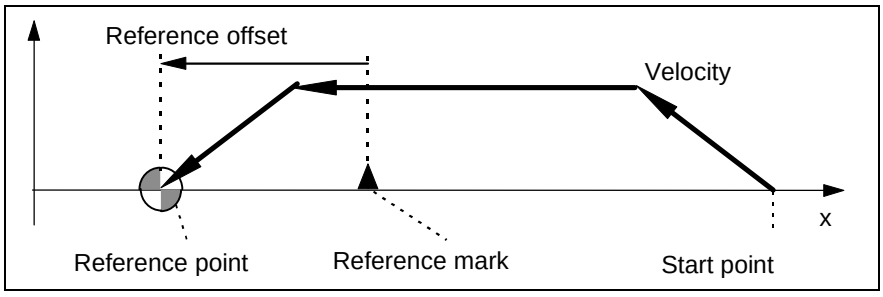


Fig. 7-78: Command profile with negative reference offset and negative homing direction

If the referencing direction is positive, then the drive can reverse the travel direction (with types 2 and 3) after passing the reference marker.

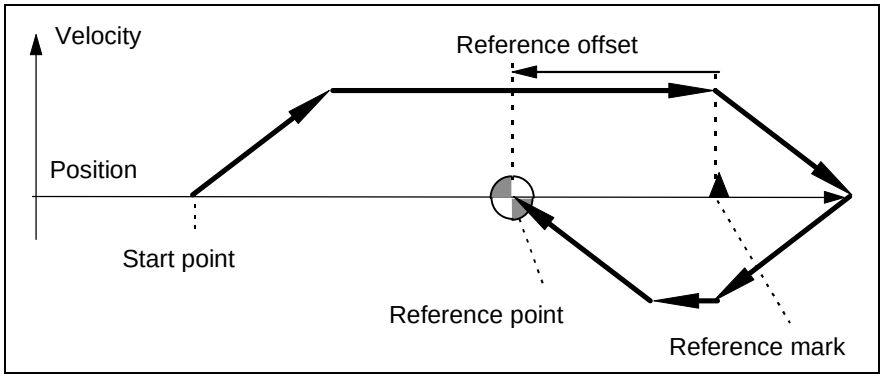


Fig. 7-79: Command profile with negative reference offset and positive homing direction

Evaluation of the Home Switch

A home switch can label a specific marker, if the configuration of several reference marks for the homing is ambiguous. If the home switch is evaluated (bit 5 in S-0-0147 = 0), then that reference mark will be evaluated, which follows the positive edge of the home switch (if the drive is moving towards the homing point).

The home switch input is pictured in parameter **S-0-0400, Home switch**.

Example: Homing of a motor encoder with 1 reference mark per revolution

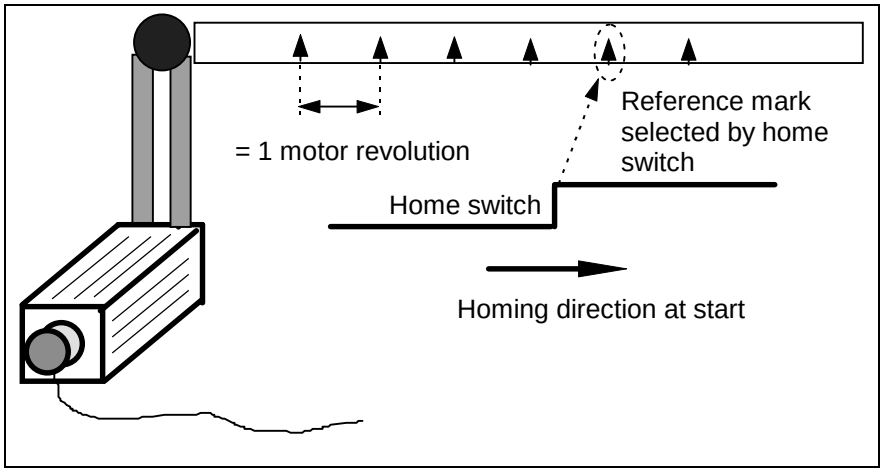


Fig. 7-80: Selection of a reference mark depending on the homing direction

If home switch evaluation is activated, the drive searches at first for the positive edge of the home switch. If the home switch is not actuated at the beginning of the command, the drive moves in the preset homing direction.

The homing direction must be set so that the positive edge can be found.

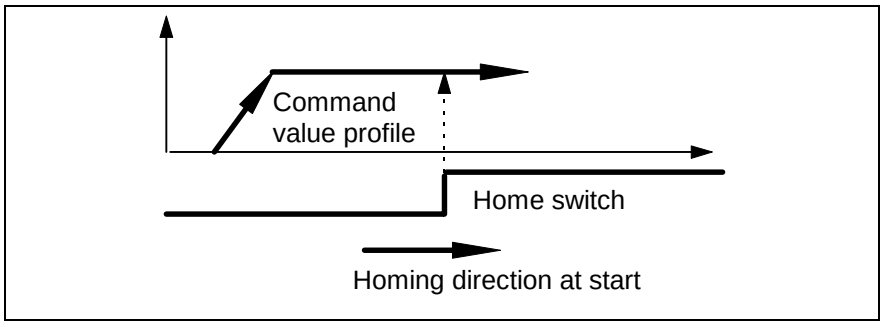


Fig. 7-81: Correct setting of homing direction

WARNING

If the homing direction setting is incorrect, the drive command value moves away from the positive home switch edge. In this case the danger exists that the drive reaches the travel range limits. This may result in damage to the system!

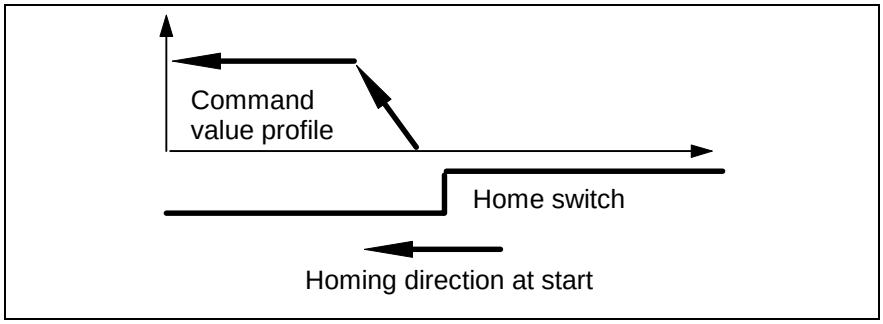


Fig. 7-82: Incorrectly set homing direction

Command value profile with actuated home switch at the start of the command

If the home switch is actuated already when the command is started, the drive generates command values in the opposite direction to move away from the home switch. As soon as a 1-0 edge from the home switch is detected, the drive reverses its direction and continues as if started outside the home switch range.

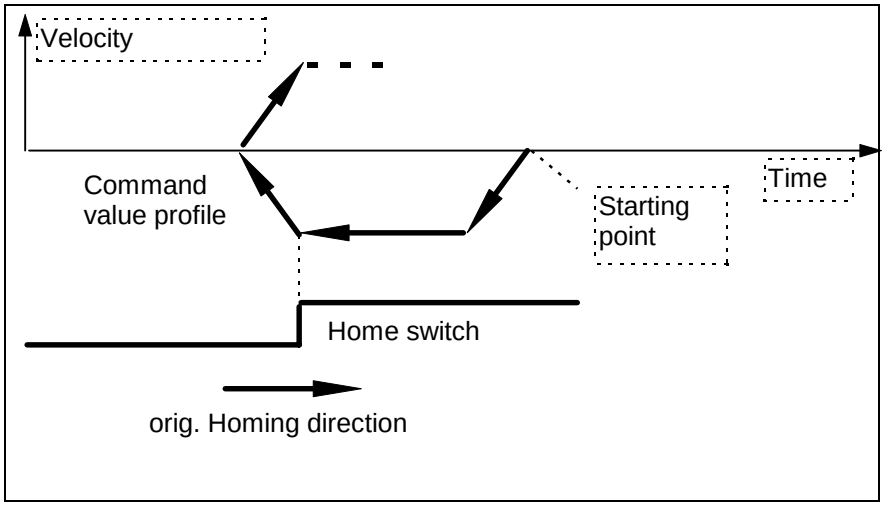


Fig. 7-83: Command profile with start position on the home switch

Monitoring the Distance Between Home switch and Homing Mark

If the distance becomes too small between the home switch edge and the reference mark, then it is possible that the home switch edge will only be detected after the reference mark has already passed. This leads to a detection of the following reference mark, and the reference mark detection becomes ambiguous.

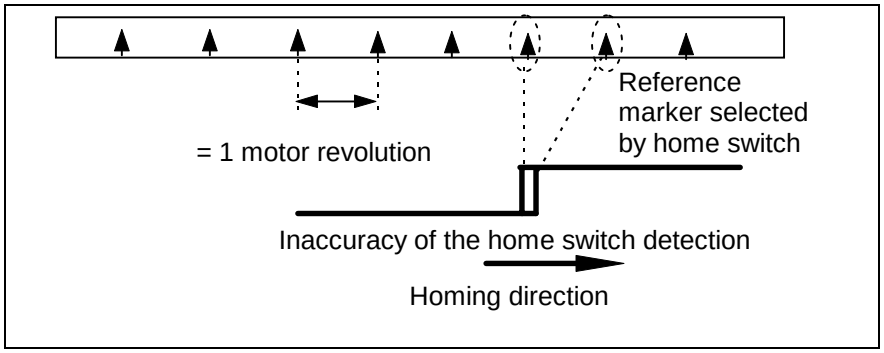


Fig. 7-84: Ambiguous detection of reference markers at small distances between home switch edge and reference mark

The distance between the home switch edge and the reference mark is monitored for this reason.

If the distance between the home switch edge and the reference mark becomes smaller than a certain value, the command error **C602 Distance home switch - reference mark erroneous** will be generated.

The Critical Range for the distance is:

0.25 • Distance between reference markers

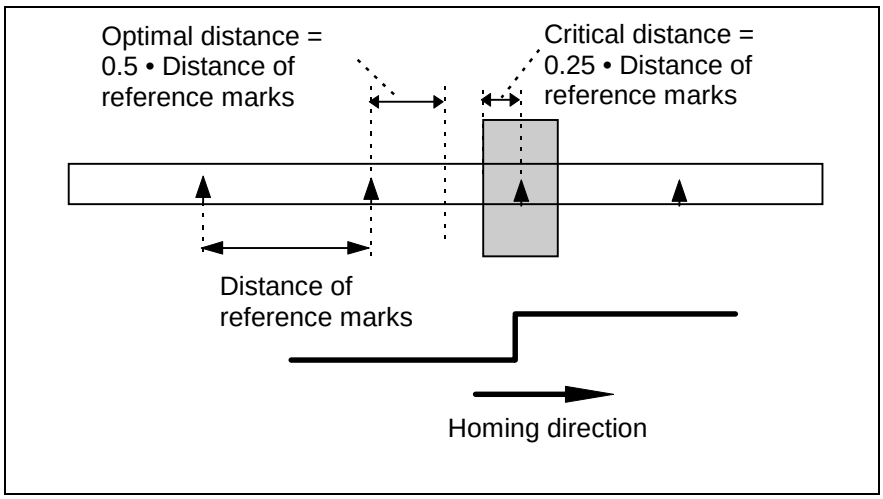


Fig. 7-85: Critical and optimal distance between home switch and reference mark

The optimal distance between the home switch edge and the reference marker is:

0.5 • Distance between reference markers

To monitor the distance between the home switch and the reference mark, the optimal distance is entered in **P-0-0153, Optimal Distance Home Switch - Reference Mark**.

The following requirements apply:

Encoder type	P-0-0153, Optimal Distance Home Switch-Reference Mark	Function
Rotary	0	The distance home switch - reference mark will be monitored. The optimal spacing will be calculated internally and amounts to a 1/2 encoder rotation for DSF or incrementally rotational encoders, or 1/2 encoder revolution / **S-0-0116, Resolution of motor feedback** for resolvers.
Rotary	x	The distance home switch - reference mark will be monitored. Half the reference mark spacing must be entered in **P-0-0153, Optimal Distance Home Switch - Reference Mark**.
Linear	0	The distance home switch - reference mark will not be monitored. The linear scale does not affect reference marks with consistent intervals. The real distance between the home switch and the reference mark must be big enough to achieve a sure recognition of the home switch edge when considering the maximum homing velocity and the cycle time for the home switch input polling.
Linear	x	The distance home switch - reference mark will be monitored. Half the reference mark spacing must be entered in **P-0-0153, Optimal Distance Home Switch - Reference Mark**.

Fig. 7-86: Monitoring the distance Home switch-Reference Mark

For every homing with home switch evaluation, the difference between actual distance and optimal distance is monitored. The difference is saved in parameter **S-0-0298, Reference Cam Shifting**. The home switch edge can be shifted mechanically for this value.

To avoid a mechanical shifting of the home switch edge, you can set this procedure in the software with the parameter **S-0-0299, Home Switch Offset**. The value in parameter **S-0-0298, Reference Cam Shifting** is transferred to parameter **S-0-0299, Home Switch Offset**.

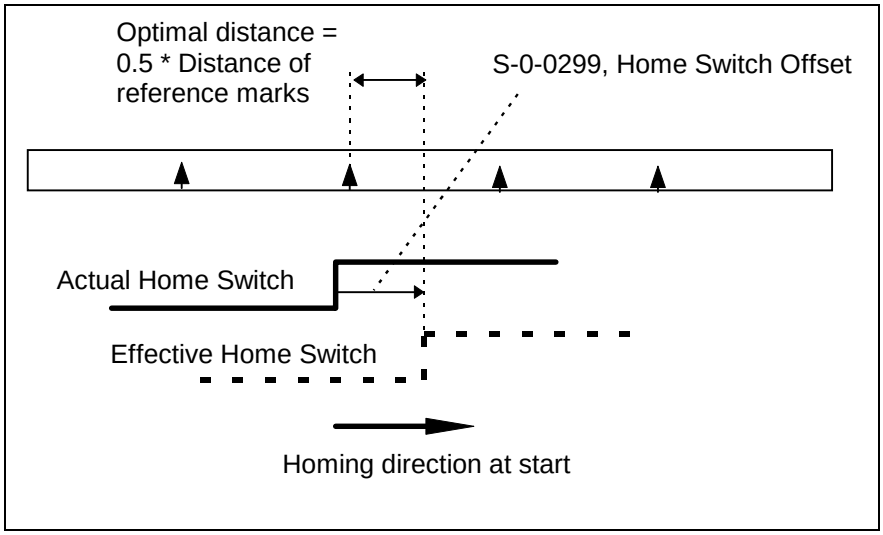


Fig. 7-87: Operation of parameter S-0-0299, Home Switch Offset

The parameter **S-0-0299, Home Switch Offset** can be set as follows:

- Running the homing command with **S-0-0299, Home Switch Offset** = 0.
- If the distance is not in the range between 0.5..1.5 * **P-0-0153, Optimal Distance Home Switch - Reference Mark,** the error message **C602 Distance home switch - reference mark erroneous** will be generated. In this case, you have to enter the value **S-0-0298, Reference Cam Shifting** into **S-0-0299, Home Switch Offset**.
- Check: You should see a 0 displayed in **S-0-0298, Reference Cam Shifting** when homing is restarted.

Connection and Configuration of the Home switch

The home switch is connected on pin E1 of the X12 connector on the DSS module. If evaluation of the home switch is activated in the homing parameter, then the external power supply is monitored on the X12 connector.

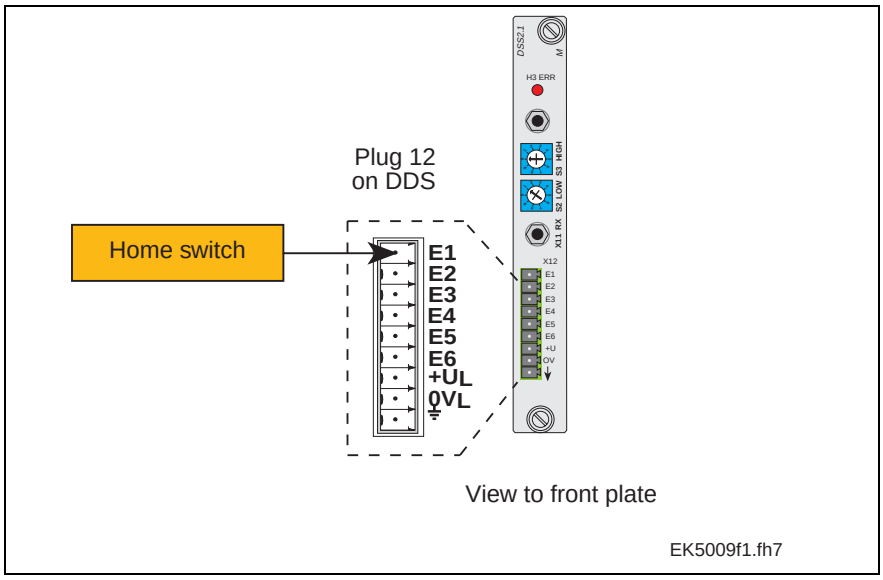


Fig. 7-88: Connection of the home switch to the DSS

Note: The home switch should be set up far enough that the "actuated" range covers more than the permissible motion range. Otherwise, the travel range may be overrun at command start if the start position is in an unfavorable position. Damage to the system is possible !

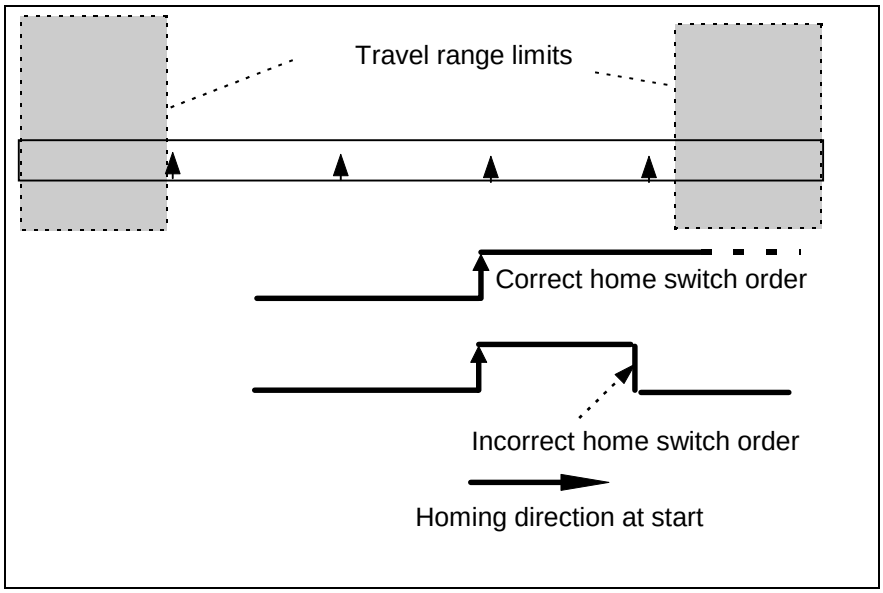


Fig. 7-89: Configuration of the home switch in reference to the travel range

If the drive-controlled homing and zero-switch evaluation feature is activated, and if the 24V supply is missing, then error **F270 Error power supply home switch** is generated.

Commissioning with "Evaluation of distance-coded reference marker"

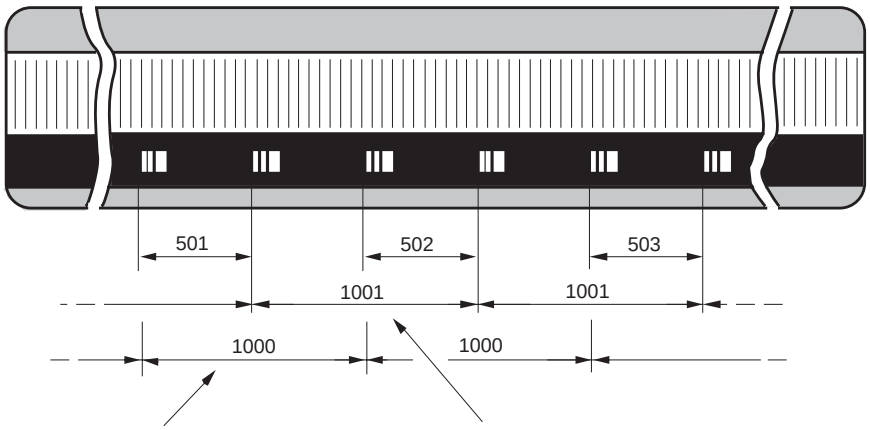
If the encoder has distance-coded reference markers (type 4), then set in **S-0-0147, Homing parameter**

- whether the home switch should be evaluated and/or
- in which direction the drive should move at the start of the command "Drive-controlled homing" ,
- whether the drive should to move to the second passed reference mark or not.

In the parameters

- **S-0-0165, Distance-coded reference offset 1** and
- **S-0-0166, Distance-coded reference offset 2**

the greater and smaller distance of the reference mark must be entered. These values can be retrieved from the encoder specification.



„Distance-coded reference dimension 2“ (smaller value) SERCOS-ID No.:S-0-0166; Input unit: pitch

The manufacturer of the length measuring system indicates:
distance travelled up to the absolute position value: 20 mm
pitch unit: 20 µm (0-02 mm)

20 mm: 0.02 mm = 1000 pitch units

This value (1000 pitch units) is to be entered in parameter ID No. S-0-0166.

„Distance-coded reference dimension 1“ (larger value) SERCOS ID No. S-0-0165. Input unit: pitch unit

For Heidenhein length measuring system the larger value is the product of:
(distance travelled + pitch unit):
pitch unit, therefore:
20.02 mm: 0.02 mm = 1001 pitch units

This value (1001 pitch units) is to be entered in parameter ID No. S-0-0165.

Setting up of distance-coded Heidenhain length measuring systems (taken from: Catalog for NC length measuring systems, September 1993):

Length measuring system Type	Distance travelled: in mm	Pitch unit: in µm	Input in: ID No.: S-0-0166	Input in: ID No.: S-0-0165
LS 403C LS 406C LS 323C LS 623C LS 106C ULS 300C	20	20	1000	1001
LS 103C LS 405C ULS 300C	10	10	1000	1001
LID 311C LID351C	20	10	2000	2001

Pi5005f1.fh5

Fig. 7-90: Distance-coded measuring system specified with greater and smaller distance

In **S-0-0165, Distance-coded reference offset 1** the greater distance is entered, in **S-0-0166, Distance-coded reference offset 2** the smaller distance. The unit of these two parameters is (division) periods. Typical vaues for a linear scale with distance-coded reference marks are 20.02 mm for the greater distance and 20.00 mm for the smaller distances with a resolution of 0.02mm. In parameter S-0-0165/166 enter the value 1001 or 1000.

The further steps are outlined below.

⇒ Check the relevant position encoder type parameter (S-0-0277/S-0-0115) to the correct setting.

⇒ The parameters **S-0-0177, Absolute distance 1** or **S-0-0178, Absolute distance 2** must be parametrized with 0.

⇒ The parameters **S-0-0041, Homing velocity** and **S-0-0042, Homing accelerating** must be set to smaller values (e.g., S-0-0041 = 10 rpm, S-0-0042 = 10 rad/s².

⇒ Execute command drive-controlled reference

Note: If the command is cleared, then the original operating mode becomes active again. If drive-internal interpolation is set, then the drive immediately goes to the value set in **S-0-0258, target position.** This value relates to the new (machine zero point related) coordinate system!

The command should be completed without error. The machine zero point is at the position of the first reference mark of the distance-coded measuring system as the absolute offset (S-0-0177/0178) was parametrized with 0. The relevant position feedback value in **S-0-0051 Position feedback value 1** or **S-0-0053, Position feedback value 2** should now have the absolute reference to this preliminary machine zero point. To set the correct machine zero point, the following steps can be conducted:

⇒ Move the axis to the desired machine zero point and enter the position feedback value displayed there with the opposite qualifying sign in **S-0-0177, Absolute offset 1** or **S-0-0178, Absolute offset 2.**

Or:

⇒ Run the axis to position feedback value = 0 and measure the distance between the current position and the desired machine zero point. Enter the distance in **S-0-0177, Absolute offset 1** or **S-0-0178, Absolute offset 2.**

Once the drive-controlled reference command is again completed, the position feedback value should refer to the desired machine zero point.

Parameters **S-0-0041, Homing velocity** and **S-0-0042, Homing acceleration** can now be set to their final values.

Home switch Evaluation with Distance coded Reference Markers

To evaluate a home switch together with homing of a distance coded measuring system is only for one purpose: staying within the allowed travel range.

Higher security with a home switch

If the home switch is not evaluated, the drive always covers with the selected homing direction the distance which is necessary to capture 2 adjacent marker positions. This distance is

$$S_{\mathrm{Re}\,f\,\max} = S - 0 - 0165 + \frac{v^2}{2\,a}$$

S-0-0165: Value in the parameter S-0-0165, Distance coded reference offset 1
v : value in S-0-0041, Homing velocity
a : value in S-0-0042, Homing acceleration
$S_{\mathrm{Re}\,f\,\max}$: maximum travel distance for homing with distance coded reference markers

Fig. 7-91: Travel distance for homing with distance coded reference markers

If the drive is closer to the travel limit in homing direction than the necessary travel distance S_{Refmax}, it can leave the allowed travel range and do mechanical damage to the machine. To avoid this,

- make sure that the distance of the axis to the travel limit at start of the command **S-0-0148, C6 Drive controlled homing** is greater than the max. necessary travel distance S_{Refmax}, or
- evaluate the home switch.

If the home switch is evaluated, the drive automatically starts in the opposite homing direction, if at command start the home switch is actuated (**S-0-0400, Home switch** = 1).

Therefore, the home switch must be mounted in such a way that it covers at least the max. necessary travel distance S_{Refmax} until reaching the travel range limit in the homing direction.

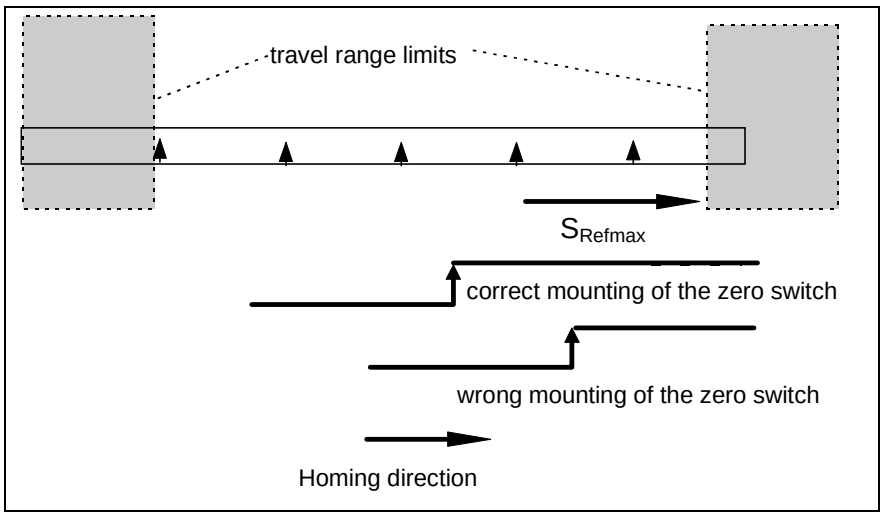


Fig. 7-92: Mounting the home switch with distance coded reference markers

Functions of the Control During "Drive-Controlled Homing"

The control's interpolator must be set to the position command value read from the drive.

During "drive-controlled homing", the drive independently generates its position command values. Preset command values of the control will be ignored. If the command is confirmed by the drive as completed, the position command value corresponding to the machine zero point will be made available in parameter **S-0-0047, Position command value**. This value must be read through the service channel by the control before ending the command, and the control interpolator must be set to this value. If this command is completed by the control and if the command values of the control for the drive become active again, these values should be added to the value read out of the drive.

Starting, interrupting and completing the command "Drive-Controlled Homing"

This feature is implemented as a command.

To start the feature, you must set and execute the command by writing to the parameter **S-0-0148, C6 Drive-controlled homing** (Input = 3 = 11bin). The drive confirmation has to be received from the data status out of the same parameter. The command is finished when the command-change bit in the drive status word is set and the confirmation changes from *in process* (7 = 111bin) to *command executed* (3 = 11bin) or to *command error* (0xF =1111bin).

If the command is interrupted (Input = 1) during processing (when confirmation = 7 = 111bin), the drive responds by activating the drive halt feature. The program continues if the interruption is canceled.

(See also "Drive Stop".)

Possible Error Messages During "Drive-Controlled Homing"

During the execution of the command, the following command errors can occur:

- **C601 Homing only possible with drive enable**
  While starting the command, the controller enable was not set.
- **C602 Distance home switch - reference mark erroneous**
  The distance between home switch and reference mark is too small, see Monitoring the Distance Between Home switch and Homing Mark on page 7-90
- **C604 Homing of absolute encoder not possible**
  The homing encoder is an absolute encoder. The command "Drive-Controlled Homing" was started without first starting the command "Set Absolute Measuring".

Homing of Gantry axis

Gantries are used to process workpieces with large surfaces. The digital AC servo drive with SERCOS interface is equipped with a "Gantry Axis" function allowing gantries to be traversed without the danger of skewing.

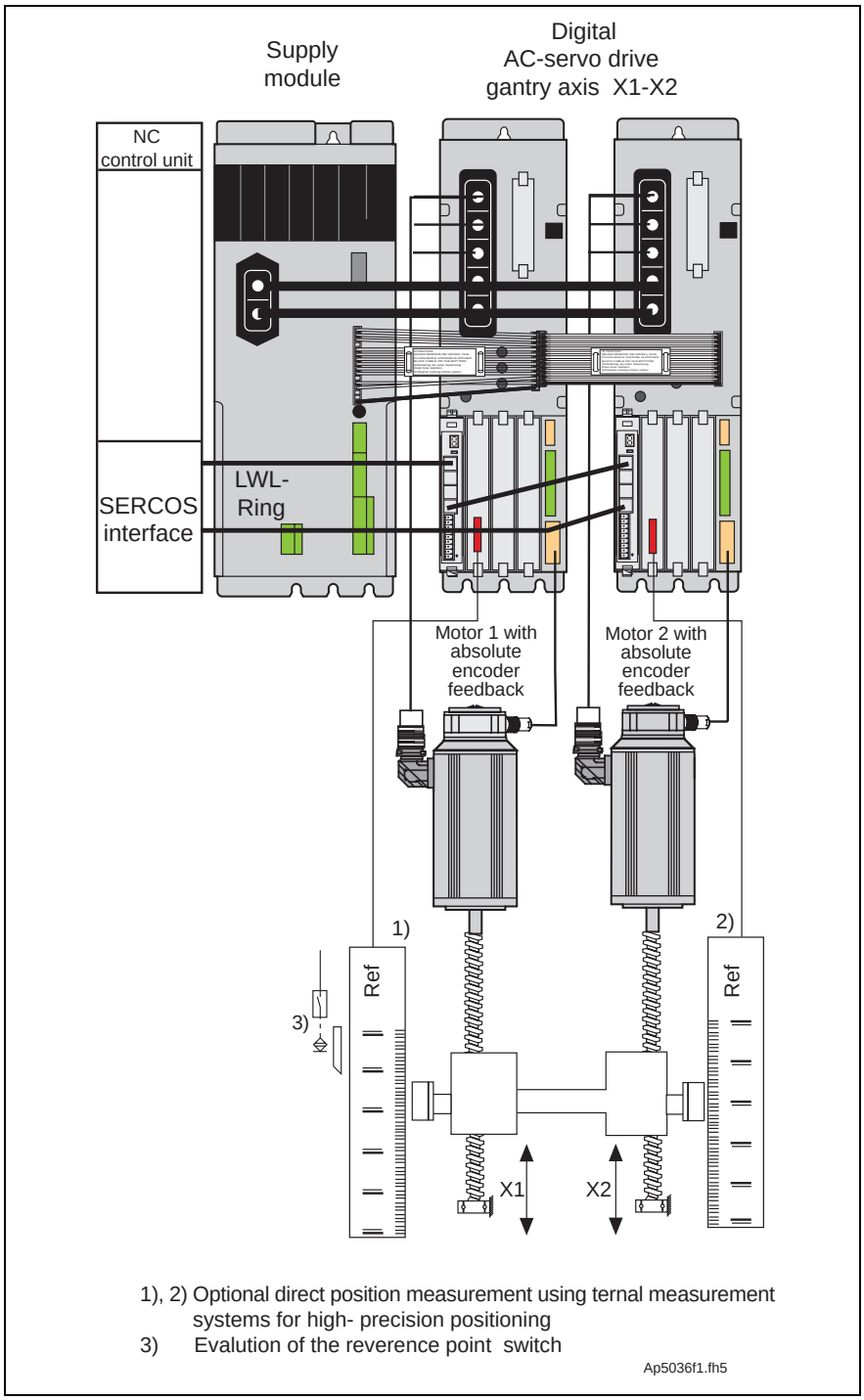


Fig. 7-93:Schematics of a "Gantry" axis with digital intelligent INDRAMAT AC servo drives

"Gantry" axes have an inherent "skewing" problem. This skewing must always be tolerated by the mechanical structure of the machine in such a way that the machine will never under any circumstances be damaged.

Pre-requisites for operating "Gantry" axes

- Both "Gantry" axes are registered as a single axis in the NC control.
- The axis are identically parametrized.
- The "Gantry" drives are equipped with absolute encoders.
- The guide rails of the gantries (X1; X2) must be parallel.

Setting up "Gantry" axes

Procedure:

I. Align the gantry axis at right angles to the traversing direction. This can be done manually or by jogging the axis.

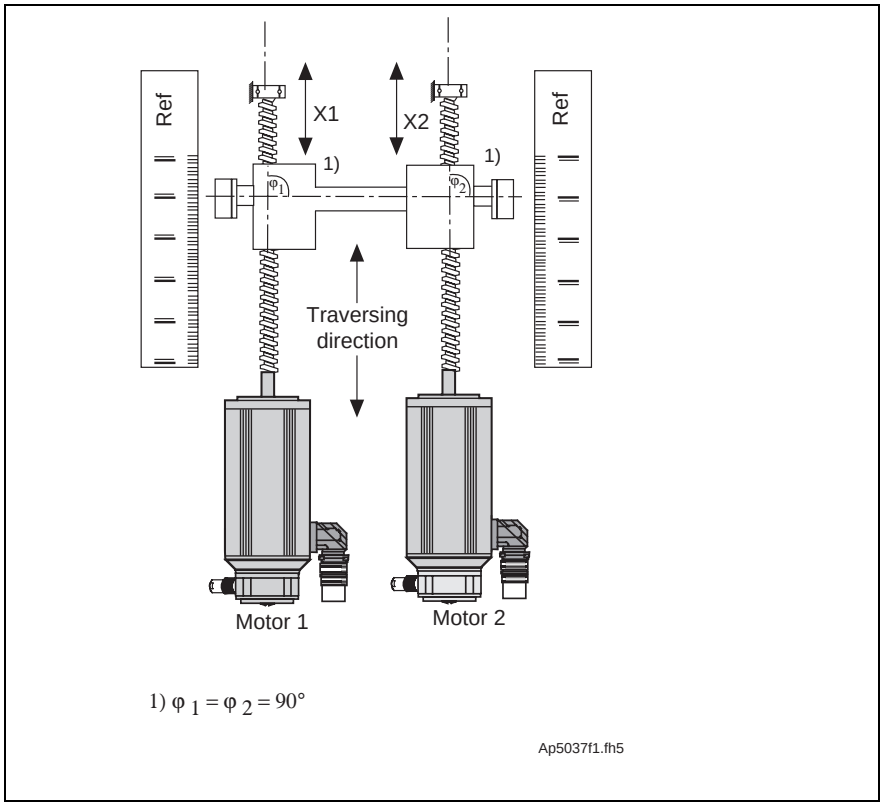


Fig. 7-94: Rectangular aligning of "Gantry" axis

II. Set absolute reference dimension

1. Record the distance from the gantry axis to the machine zero point.
2. Enter distance A to machine zero point in parameter **S-0-0052 Reference distance 1.**
3. Trigger command **P-0-0012 Set absolute Measurement.**
4. Cancel the drive enable signal.
   The value entered in parameter **"Reference distance 1"** is transferred to **S-0-0051 feedback value 1.**
5. Reset the command.

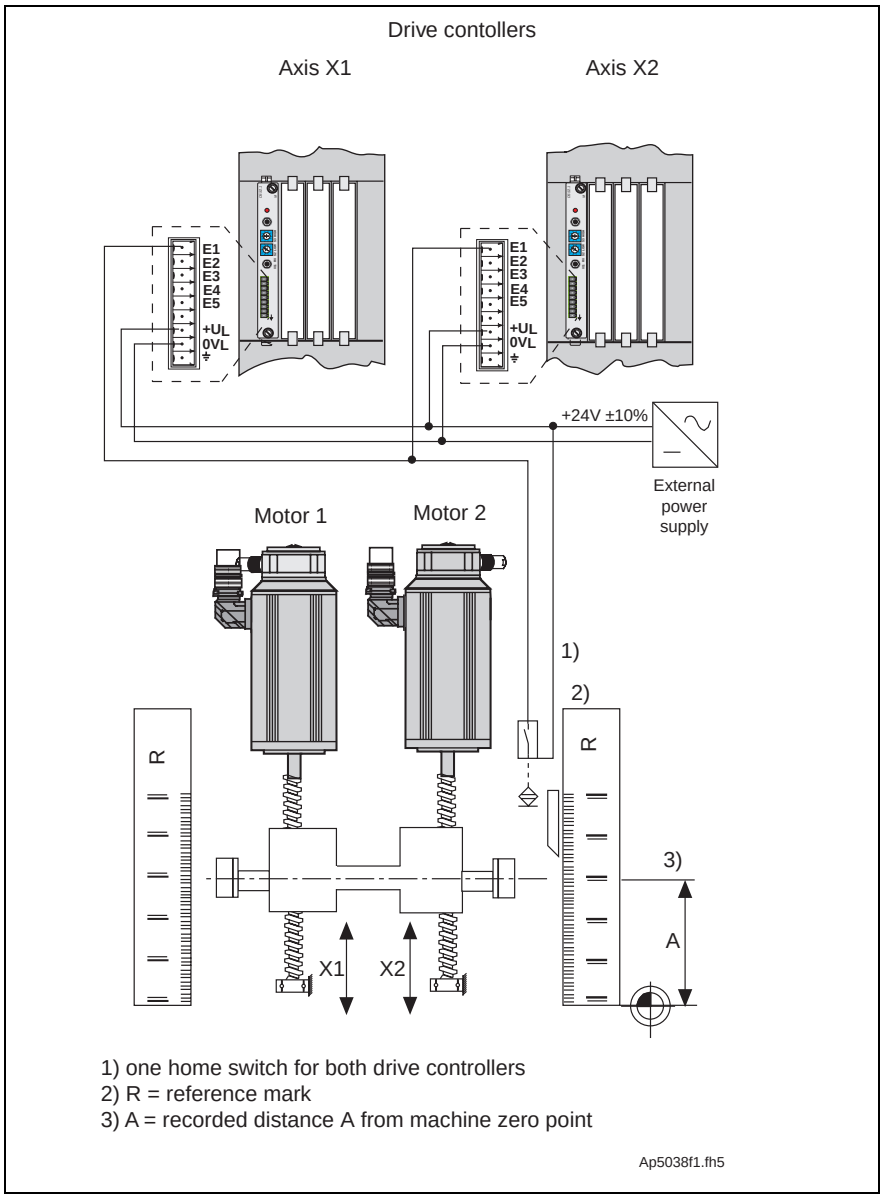


Fig. 7-95:Connecting the home switch to the drive controllers of gantry axis X1/X2

III. Setting the reference distance of the direct position measuring system (if installed).

Procedure:

- Set the homing procedure parameters
  S-0-0041 homing velocity
  S-0-0042 homing acceleration
  S-0-0147 homing parameter
  S-0-0108 feedrate override

  in both axis to the same values. Check the connection of the home switch as illustrated below.
- Check that the home switch works correctly.

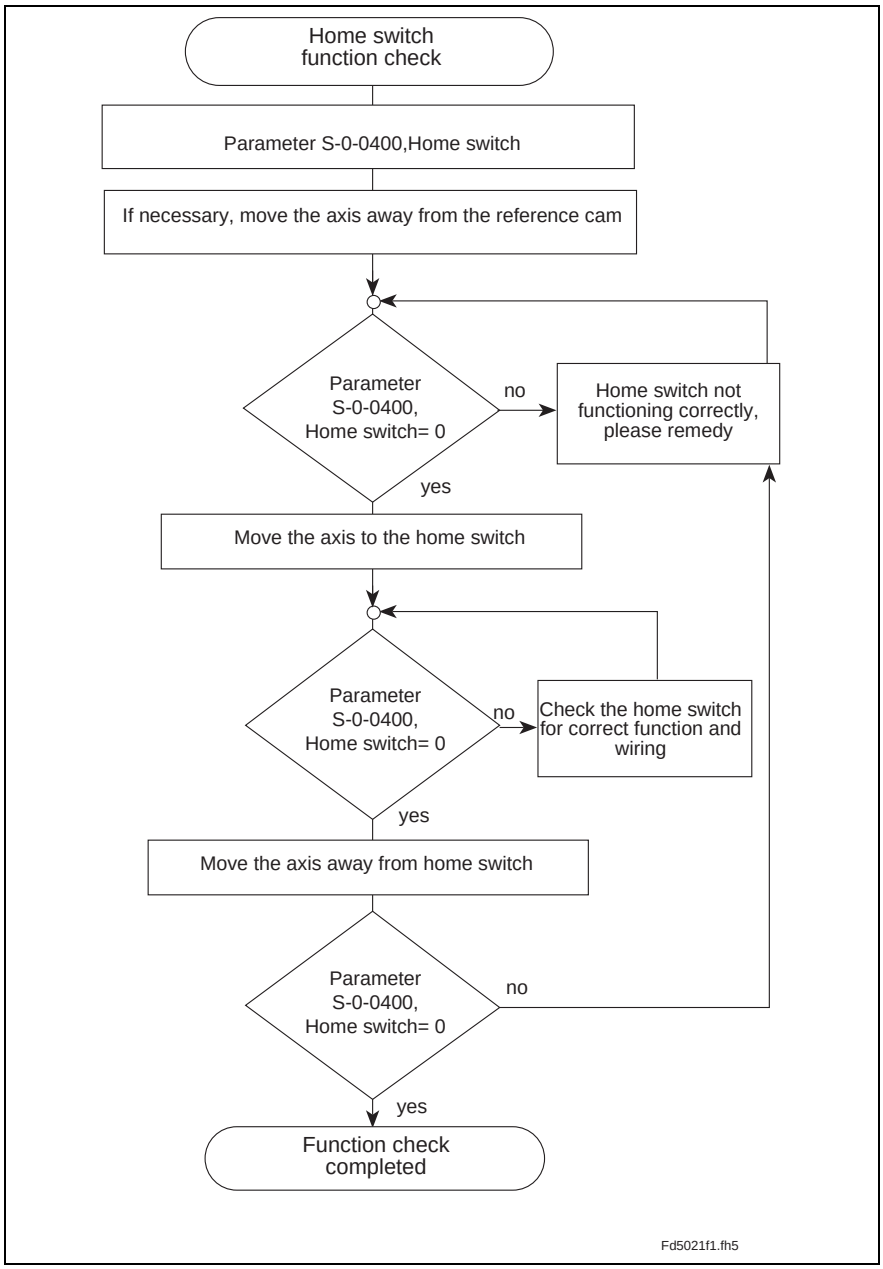

Home switch function check
Parameter S-0-0400,Home switch
If necessary, move the axis away from the reference cam
Parameter S-0-0400, Home switch= 0
no
Home switch not functioning correctly, please remedy
yes
Move the axis to the home switch
Parameter S-0-0400, Home switch= 0
no
Check the home switch for correct function and wiring
yes
Move the axis away from home switch
Parameter S-0-0400, Home switch= 0
no
yes
Function check completed
Fd5021f1.fh5

Fig. 7-96:Checking the function of the home switch

- Detecting the reference mark positions of external feedback systems

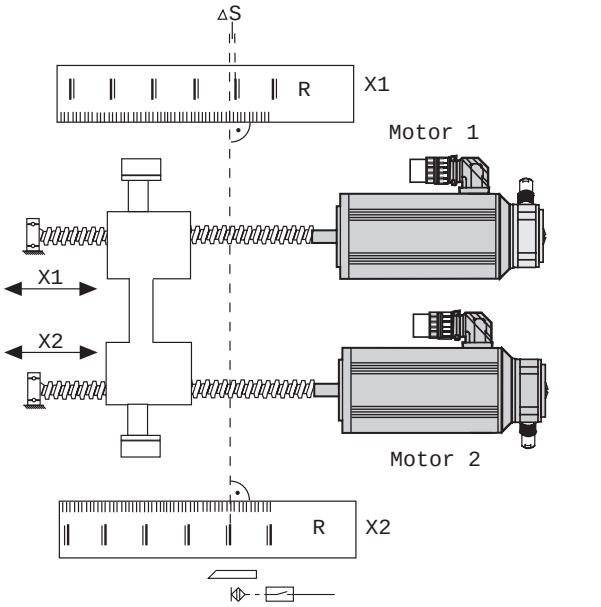


Fig. 7-97: Position offset of reference marks in the direct measuring system of gantry axes X1/X2

Procedure:

1. Trigger command **P-0-0014 Determine marker position** in both axis (see control manual).
2. Move both axis towards the reference marks by forwarding the same position command values through the NC control.

Note	The direction of travel must be the same as that of the subsequent homing cycle. (Bit 0, **S-0-0147 homing parameter**)

On reaching the relevant reference mark of the linear scale, each of the two drives stores the actual position feedback value 2 in the relevant corresponding marker position (**S-0-0173 Marker position A**). Once the reference marks have been acquired, the drive acknowledges the command "Determine marker position". When both gantry axes have acknowledged the command, the NC control must brake the drives to a standstill.

3.Determining the reference mark offset (ΔS):

ΔS =	Markerposition axis X1 **(S-0-0173, Marker position A)**	-	Marker position axis X2 **(S-0-0173 Marker position A)**

- Compute and enter reference offset 2 of each axis.

For the axis whose reference mark occurs first, it applies:

$$S\text{-}0\text{-}0151,\ \text{Reference offset 2} \geq \frac{Vref^2}{2 \times a_{ref}} + \Delta S$$

ΔS	reference mark spacing
V_{ref}	S-0-0041, Homing velocity
a_{ref}	S-0-0042, Homing acceleration

Fig. 7-98: Computing S-0-0151, reference offset 2 for the axis whose reference mark occurs first

For the axis whose reference mark occurs last, it applies:

$$S\text{-}0\text{-}0151,\ \text{Reference offset 2} \geq \frac{Vref^2}{2 \times a_{ref}}$$

V_{ref}	S-0-0041, reference travel velocity
a_{ref}	S-0-0042, reference travel acceleration

Fig. 7-99:Computing S-0-0151, reference offset 2 for the axis whose reference marks occurs last

Danger:
A reversal of direction of travel of one of the two drives may lead to accidents. This will happen when the values entered in Reference Offset 2 are lower than the computed ones.

The polarity of parameter S-0-0151 reference offset 2 must be selected so that the reference point shifts in the direction of the reference travel. That means, with negative homing direction in one or both axis, also the reference offset must be input with neg. sign. This avoids a direction reversal after passing the reference mark

(See "Consideration of the Reference Offset".)

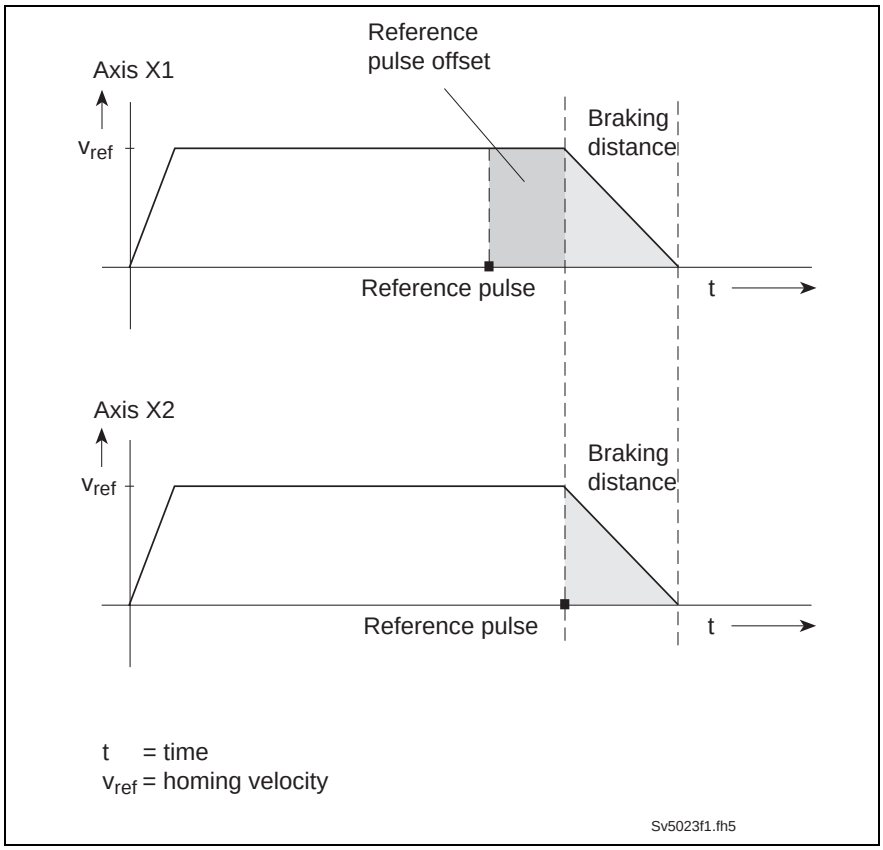


Fig. 7-100: Velocity paths of gantry axis during homing

7.11 Language Selection

With the parameter **S-0-0265, Language Selection** you can switch between several languages for

- Parameter names and units
- Diagnostic texts

At this time, the following languages are implemented:

Value of S-0-0265:	Language:
0	German
1	English
2	French
3	Spanish
4	Italian

Fig. 7-101: Language Selection

8 Extended Drive Functions

8.1 Analog Output

With the help of the function "Analog output" drive-internal signals and state variables can be generated as analog voltage signals. These can be examined with an oscilloscope connected to the analog outputs.

The conversion of the digital values from the drive is done via two 8 bit digital-to-analog converters. The maximum output voltage equals +/- 10 volts. There is an output every 250 µs.

Possible output functions

1. Direct writing into the analog outputs
2. Assigning ID numbers to analog outputs
3. Output of pre-set signals
4. Byte output of RAM memory cell
5. Bit output of RAM memory cells

To parametrize the function, the following parameters are available:

- **P-0-0139, Analog output 1**
- **P-0-0140, Analog output 2**
- **P-0-0420, Analog output 1, signal selection**
- **P-0-0421, Analog output 1, expanded signal selection**
- **P-0-0422 Analog output 1, scaling**
- **P-0-0423, Analog output 2, signal selection**
- **P-0-0424, Analog output 2, expanded signal selection**
- **P-0-0425, Analog output 2, scaling**
- **P-0-0426 Analog outputs, IDN list of assignable parameters**

Direct analog outputs

With the parameters **P-0-0139, Analog output 1** and **P-0-0140, Analog output 2** it is possible for the control to use the two 8 bit digital/analog converters of the drive. Voltage values written into these parameters, ranging between -10.000 volts and +10.000 volts, are output by the drive to the analog outputs. The quantization equals 78 mV.

A precondition for the use of an analog output is that the signal selection (P-0-0420 or P-0-0423) and the expanded signal selection (P-0-0421 or P-0-0424) were deactivated by inputting 0 for the used channel.

Analog output of existing parameters

All parameters in the list **P-0-0426 Analog output, IDN list of assignable parameters** can be output analog.

This first requires that their ID number be input in the signal select for channel 1 (P-0-0420) or 2 (P-0-0423). The unit and the attribute (number of decimal places) of the relevant scaling (P-0-0422 or P-0-0425) is set as per the selected parameter. If the selected parameter depends on a scaling mode, then the settings there apply to the scaling as well.

With **P-0-0422 Analog output 1, scaling** or **P-0-0425, Analog output 2, scaling** is it then fixed at what value 10 volts are output.

For example, for rotary preferred position scaling and signal selection position command (S-0-0047), the unit of the scaling factor is set to degrees, and the number of decimal places is set to four. Inputting 90.0000 degrees in the evaluation factor means that 10 volts per 90 degrees at the load will be output .

If signals with a binary format are selected (e.g., **S-0-0134, Master control word)** then the display format of the scaling is set to decimal without fractional part. There is no unit. With this scaling, a bit number between 0 and 15 is selected. The state of this bit of the set parameter is then output in such a way that for 0 -10 volts are output and for 1 +10 volts (bit output).

See also Control loop structure in chapter General Information for Control Loop Settings

Outputting pre-set signals

To be able to show such signals in an analog manner, which do not exist as a parameter, there a way to select these via predefined signal numbers and to output these via the expanded analog output. The parameters **P-0-0421, Analog output 1, expanded signal selection** and **P-0-0424, Analog output 2, expanded signal selection** do the selection.

The expanded output only functions if the signal select for the channel used (P-0-0420 or P-0-0423) is deactivated by inputting the ID number 0.

The following list shows which signal is output with which signal number.

Signal number P-0-0421/424	Output signal	Reference unit: Evaluation factor 1.0000
0x00000001	motor encoder sine signal	0.5V/10V
0x00000002	motor encoder cosine signal	0.5V/10V
0x00000003	Ext. enc. sine signal	0.5V/10V
0x00000004	Ext. enc. sine cosine	0.5V/10V
0x00000005	Position command difference on the pos. controler	rot. ⇒ 1000rpm/10V lin. ⇒ 100m/min/10V
0x00000006	DC bus power	1kW/10V
0x00000007	absolute DC bus power amount	1kW/10V
0x00000008	effective current	S-0-0110/10V
0x00000009	relative current	S-0-0110/10V
0x0000000a	thermal load	100 % / 10V

0x0000000b	motor temperature	150°C/10V
0x0000000c	magnetizing current	S-0-0110/10V
0x0000000d	velocity command at the velocity controller	rot. ⇒ 1000rpm/10V lin. ⇒ 100m/min/10V

Fig. 8-1: Signal selection list with pre-defined signal selection

See also Control loop structure in chapter General Information for Control Loop Settings

This information is scaling independent and always relates to the motor shaft. The scaling of the signals is possible via the parameters **P-0-0422 Analog output 1, scaling** and **P-0-0425 Analog output 2, scaling.** These have been set as factors with 4 decimal places in the expanded signal selection. If the evaluation factors are 1.0000, then the standards specified in the table apply.

Example:

Output of the position command difference with a value of 150rpm/10V on channel 1.

Input:

P-0-0420, Analog output 1, signal selection = S-0-0000

P-0-0421, Analog output 1, expanded signal selection = 0x00000005

P-0-0422 Analog output 1, scaling = 0.1500

Bit and byte outputs of the data memory

This function can only be used with the information about the structure of the memory of the drive processor. The structure, however, changes with each version. The function can thus only be used by the relevant developers.

The bit and byte output is only possible if the signal selection for the used channel (P-0-0420 or P-0-0423) is deactivated by inputting the ID number 0.

The selection of the function and the storage address takes place in the parameters **P-0-0421, Analog output 1, expanded signal selection** and **P-0-0424, Analog output 2, expanded signal selection**. In the high nibble (half byte with bits 28..31), byte output is activated with a 1 and bit output with a 2. The low word of the parameter inputs the storage address.

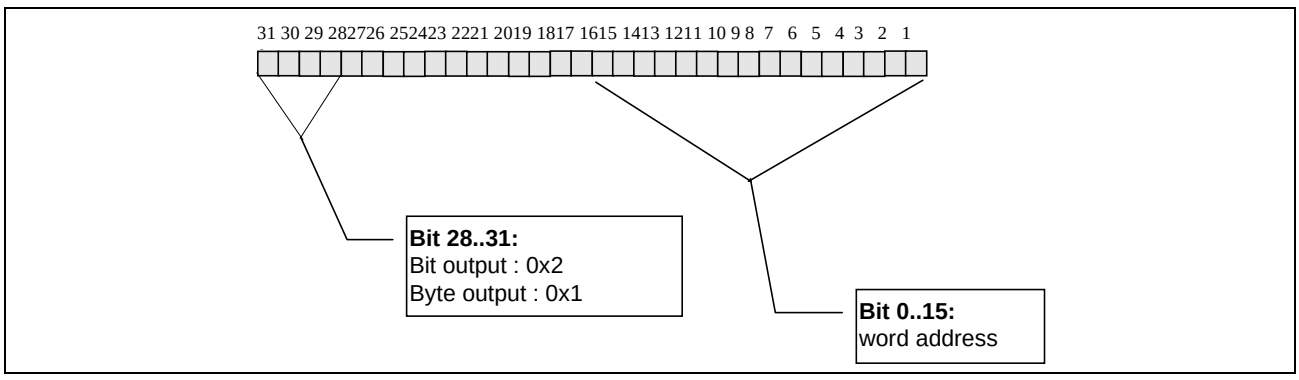


Fig. 8-2: Parametrizing bit or byte output

The parameters **P-0-0422 Analog output 1, scaling** and **P-0-0425 Analog output 2, scaling** either select the bit to be output or it can be determined from which (least signifiant) bit on the byte to be generated will start. When selecting the bit number, only values between 0 and 15 make sense. If greater values are entered, then only bits 0..3 are used.

When outputting bits, -10 volt (bit = 0) or +10 volt (bit = 1) is output.

With byte outputs, the MSB of the byte to be output is interpreted as sign bit. Voltages ranging from -10 to +10 volts are output.

Terminal assignment - analog output

The output of the analog signals uses connector X3 of the basic unit.

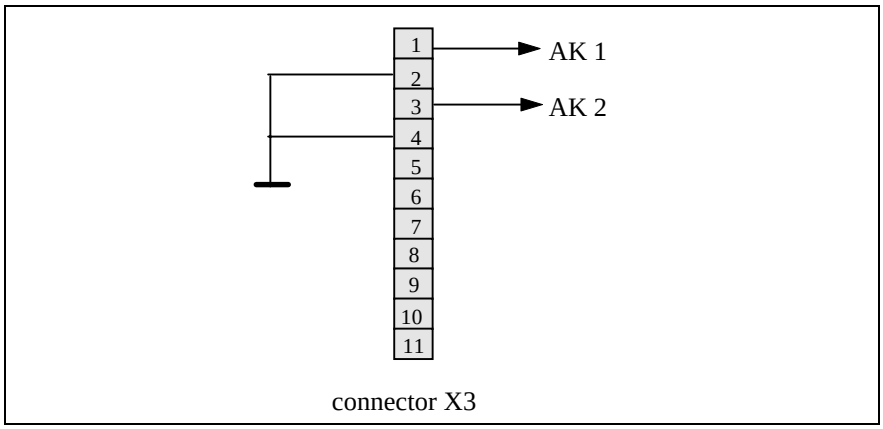


Fig. 8-3: Terminal assignment of analog output

8.2 Analog Inputs

Using the function "Analog inputs", two analog inputs can be shown via analog/digital converters in one parameter each. The analog voltages, in the form of both of these parameters, can then either be

- transmitted to the control and supports the control as an analog input function or
- it can be assigned in the drive to a different parameter taking a settable scaling and a settable offset into account.

The following parmeters are available for the function:

- **P-0-0210, Analog input 1**
- **P-0-0211, Analog input 2**
- **P-0-0212, Analog inputs, IDN list of assignable parameters**
- **P-0-0213, Analog input 1, Assignment**
- **P-0-0214, Analog input 1, Scaling per 10V**
- **P-0-0215, Analog input 2, Assignment**
- **P-0-0216, Analog input 2, Scaling per 10V**
- **P-0-0217, Analog input 1, Offset**
- **P-0-0218, Analog input 2, Offset**

Functional principle of the analog inputs

This function needs the plug-in module DAE02.1. At the connector X75 of this module, the two **differential inputs** E1+ / E1- and E2+ / E2- are located.

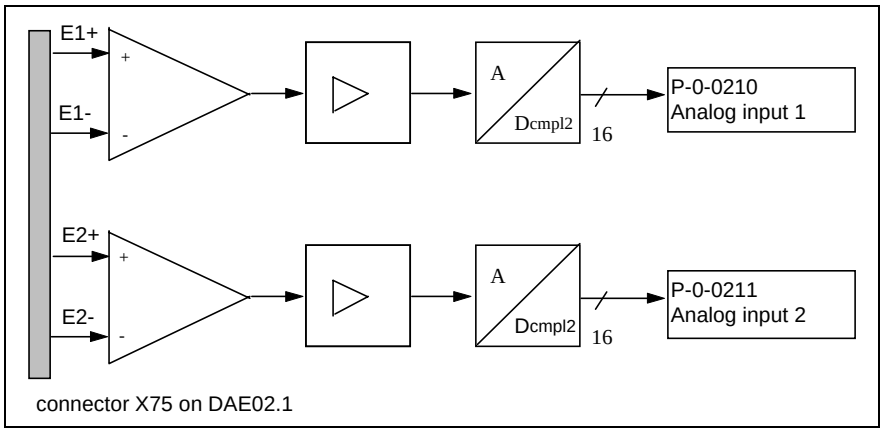


Fig. 8-4: Functinal principle of the analog inputs

The digitalized voltages of both differential inouts are displayed in the parameters **P-0-0210, Analog input 1** and **P-0-0211 Analog input 2.** The analog/digital conversion is performed via a two channel 14Bit ADC with fourfold oversampling.

Assignment of analog inputs to parameters

Both **P-0-0210, analog input 1** and **P-0-0211 analog input 2**, which depict the analog-to-digital converted voltages, can be assigned to other drive parameters, i.e., they can be cyclically copied while taking

- an offset and
- a selectable scaling

into account.

Note: Analog channel 1 is processed every 250 µs, channel 2 every 8 ms.

The assignment applies the following principle:

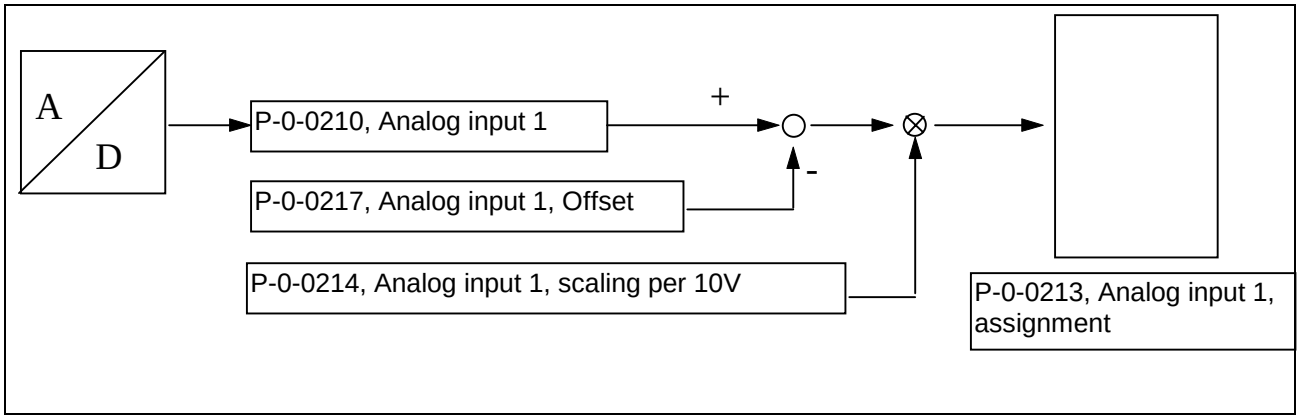


Fig. 8-5: Functional principle of assigning analog input 1 to a parameter

The converted voltage signals of both differential inputs are stored in parameter **P-0-0210, Analog input 1** or **P-0-0211, Analog input 2** respectively. An assignment of an analog input to a parameter is activated if in parameter **P-0-0213, Analog input 1, assignment** or **P-0-0215, Analog input 2, Assignment** a value not equal to S-0-0000 has been parametrized. The contents of **P-0-0210, Analog input 1** or **P-0-0211, Analog input 2** minus the contents of **P-0-0217, Analog input 1, Offset** or **P-0-0218, Analog input 2, Offset** is scaled with the scaling factor set in **P-0-0214, Analog input 1, Scaling** per 10V or **P-0-0216, Analog input 2, scaling** per 10V and then copied into the parameter with the ID number set for the assignment in **P-0-0213, Analog input 1, Assignment** or **P-0-0215, Analog input 2, Assignment**.

The **unit** of the parameter **P-0-0214, Analog input 1, Scaling** per 10V or **P-0-0216, Analog input 2, Scaling** per 10V complies with the unit of the assigned parameter.

Only those parameters can be assigned that are listed in **P-0-0212, Analog inputs, IDN list of assignable parameters**.

Example: Assignment of analog input 1 to **S-0-0036, velocity command value** with 10 V equal to 1000 rpm

Parameter setting:

P-0-0213, analog input 1 = S-0-0036

P-0-0214, analog input 1, evaluation per 10V = 1000.0000 rpm

8.3 Digital Input/Output

The "digital input/output" feature allows for binary inputs and outputs through the DEA plug-in modules. DEAs 4, 5 and 6 offer 15 binary inputs and 16 binary outputs each. DEAs 8, 9 and 10 have 32 inputs and 24 outputs each.

The following DEA modules are supported:

- DEA 4.1
- DEA 5.1
- DEA 6.1
- DEA 8.1
- DEA 9.1
- DEA 10.1

There may not be two interface cards of the same kind in a drive controller. Each drive controller can have a maximum of 96 inputs (3•32) and 72 outputs (3•24).

The following parameters are available for this feature:

- **P-0-0081, Parallel I/O Output 1**
- **P-0-0082, Parallel I/O Input 1**
- **P-0-0110, Parallel I/O Output 2**
- **P-0-0111, Parallel I/O Input 2**
- **P-0-0112, Parallel I/O Output 3**
- **P-0-0113, Parallel I/O Input 3**
- **P-0-0124, Assignment IDN -> DEA-Output**
- **P-0-0125, Assignment DEA-Input -> IDN**
- **P-0-0170, Parallel I/O Output 4**
- **P-0-0171, Parallel I/O Input 4**
- **P-0-0172, Parallel I/O Output 5**
- **P-0-0173, Parallel I/O Input 5**
- **P-0-0174, Parallel I/O Output 6**
- **P-0-0175, Parallel I/O Input 6**

It is also possible to assign a DEA output or DEA input to the current value of a parameter.

Digital I/O Functional Principle

The parameters "parallel input" and "parallel output" can be configured cyclically.

The binary in- and outputs are reflected in the parameters "Parallel input" and "Parallel output".

Two parameters are available for each DEA. The following assignment applies:

DEA Module:	Parameter for Input:	Parameter for Output:
DEA 4.1	P-0-0082	P-0-0081
DEA 5.1	P-0-0111	P-0-0110
DEA 6.1	P-0-0113	P-0-0112
DEA 8.1	P-0-0171	P-0-0170
DEA 9.1	P-0-0173	P-0-0172
DEA 10.1	P-0-0175	P-0-0174

Fig. 8-6: Digital Input/Output: Assigned Parameters

By reading the parameter "parallel input", you can obtain an image of the existing binary inputs of a DEA. By writing the parameter "parallel output", the binary outputs are updated.

The assignment of individual binary inputs and outputs to the bit numbers of the corresponding parameters for DEAs 4, 5 and 6 are defined as follows:

Pin No. Input:	Bit No. in the Parameter:	Pin No. Output:
1	0 (LSB)	16
2	1	17
3	2	18
4	3	19
5	4	20
6	5	21
7	6	22
8	7	23
9	8	24
10	9	25
11	10	26
12	11	27
13	12	28
14	13	29
15	14	30
--	15 (MSB)	31

Fig. 8-7: Digital Input/Output: Bit Output Assignment - DEA 4, 5, 6-Module

This applies for the DEAs 8 , 9 and 10:

Pin no. input:	Bin no. in parameter:	Pin no. output:
1	0 (LSB)	12
2	1	13
3	2	14
4	3	15
5	4	16
6	5	17
7	6	18
8	7	19
9	8	33

10	9	34
11	10	35
22	11	36
23	12	37
24	13	38
25	14	39
26	15	40
27	16	53
28	17	54
29	18	55
30	19	56
31	20	57
32	21	58
43	22	59
44	23	60
45	24	-
46	25	-
47	26	-
48	27	-
49	28	-
50	29	-
51	30	-
52	31	-

Fig. 8-8: Digital input/output: Assigning bit output - DEA 8, 9, 10 module

The parameter "parallel output" is copied to the DEA port every 250 µs. Likewise, the DEA port is copied to the "parallel input" every 250 µs.

Note: An external power supply must be connected to operate a DEA card.

It applies to DEA 4, 5 and 6:

Pin 37: 24 V_{ext}

Pin 35 0 $V_{ext.}$

It applies to DEA 8, 9 and 10:

Pin 41, 61: 24 V_{ext}

Pin 21, 42, 62 0 $V_{ext.}$

If the power supply is missing, the **F233 External power supply error** will be generated.

Allocating ID Number - Parallel I/O

The current value of any desired parameter can be exported to the binary output of a DEA. Likewise, the binary inputs of a DEA can be mapped onto the current value of any desired parameter.

This feature is set with the parameters:

- **P-0-0124, IDN -> DEA-Output Assignment**
- **P-0-0125, DEA-Input -> IDN Assignment**

The parameters are structured as follows:

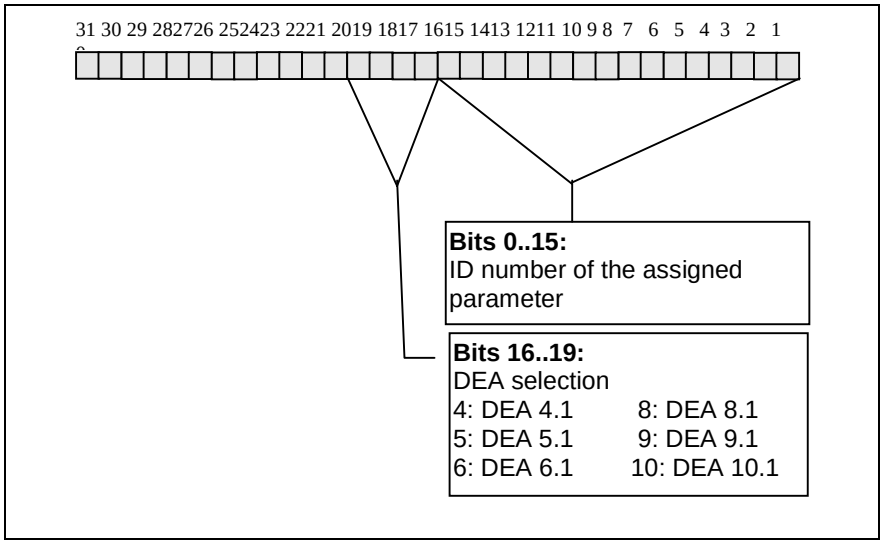


Fig. 8-9: Structure of Parameters P-0-0124 and P-0-0125

IDN -> DEA-Output Assignment

With the IDN -> DEA-Output Assignment, the current value of the assigned parameter is copied to the DEA output parameter; this is exported to the DEA outputs.

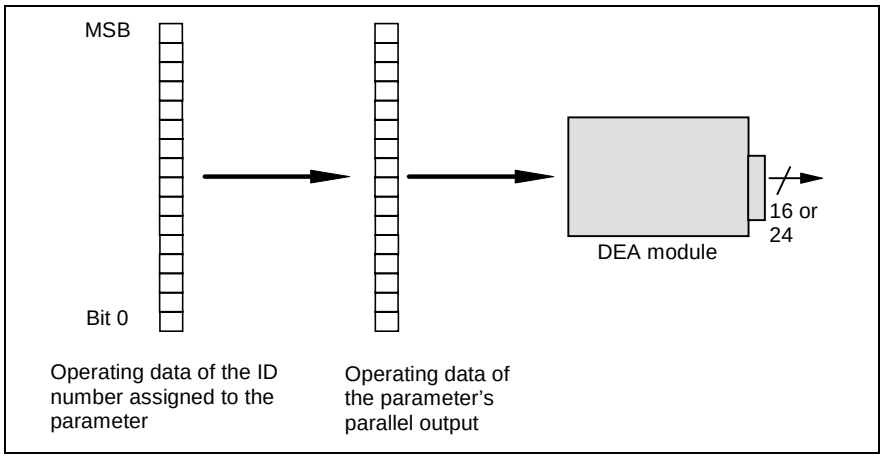

MSB
Bit 0
16 or 24
DEA module
Operating data of the ID number assigned to the parameter
Operating data of the parameter's parallel output

Fig. 8-10: Principle of assigning an ID number to a DEA output

If the data length of the current value for the assigned ID number is greater than 16 bits, then the upper bits of the current value will be truncated.

When the parameter **P-0-0124, Assignment IDN -> DEA-Output** is written, then the following will be checked:

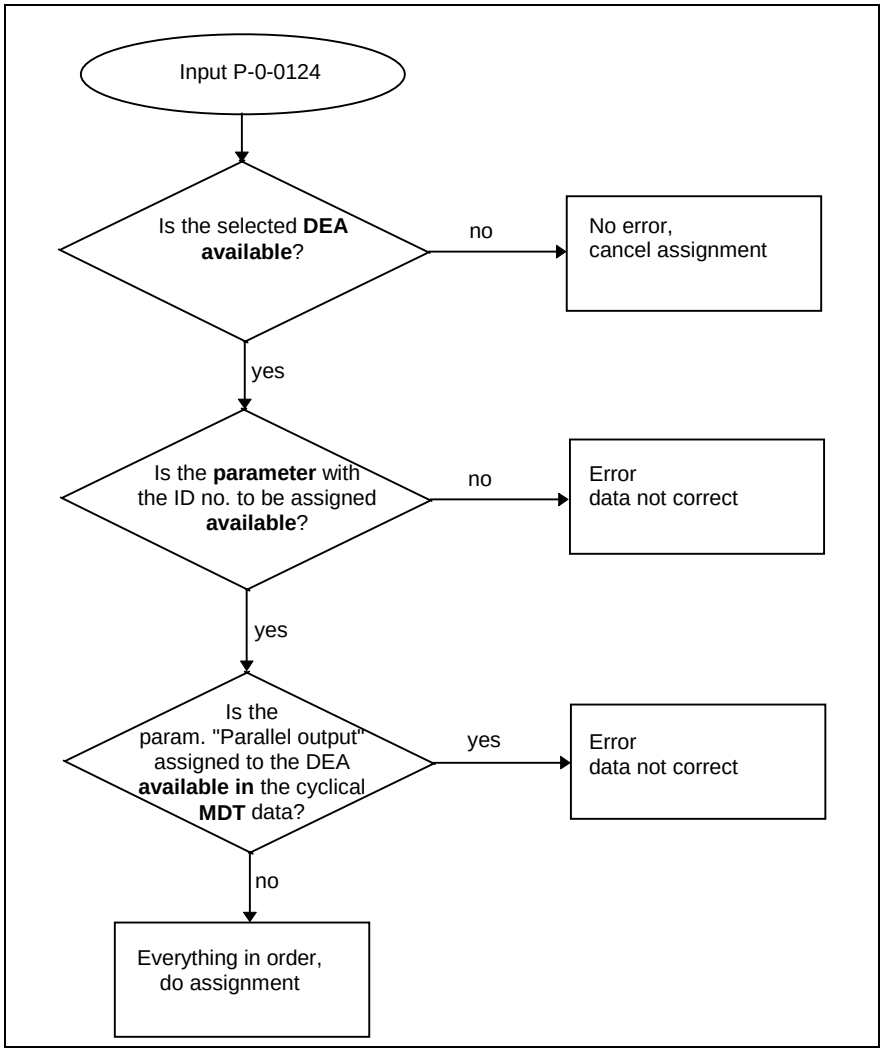

Input P-0-0124
Is the selected **DEA available**?
no
No error, cancel assignment
yes
Is the **parameter** with the ID no. to be assigned **available**?
no
Error data not correct
yes
Is the param. "Parallel output" assigned to the DEA **available in** the cyclical **MDT** data?
yes
Error data not correct
no
Everything in order, do assignment

Fig. 8-11: Checks when inputting parameter P-0-0124, assigning ID number -> DEA- output

DEA-Input -> IDN Assignment

During the "DEA Input -> ID Number" assignment, all binary inputs of the DEA are mapped onto the "DEA Input" parameter; the parameter is then copied to the current value of the assigned parameter.

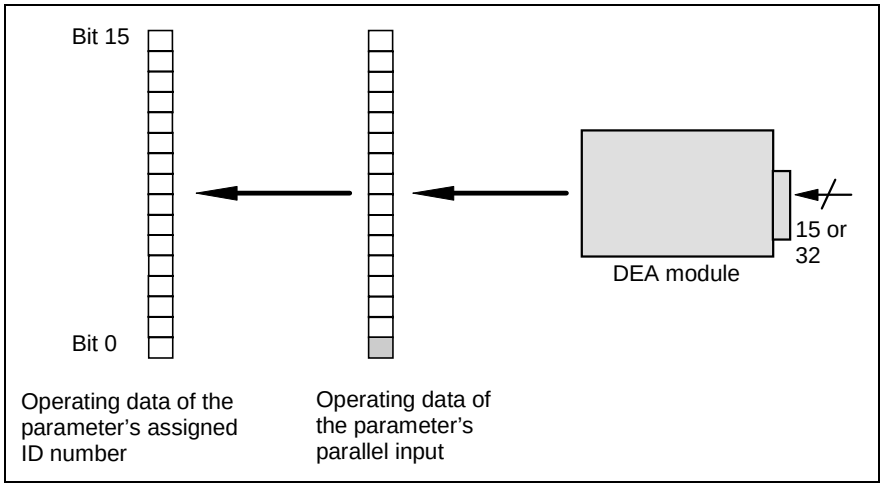

Bit 15
Bit 0
15 or 32
DEA module
Operating data of the parameter's assigned ID number
Operating data of the parameter's parallel input

Fig. 8-12: Diagram for DEA-Input -> IDN Assignment

If data length of the current value for the assigned ID number exceeds 16 bits, then the upper bits of the operating data in DEA 4, 5 and 6 are cut off (truncated).

If the parameter **P-0-0125, Assignment DEA-Input -> IDN** is written, then the following will be checked:

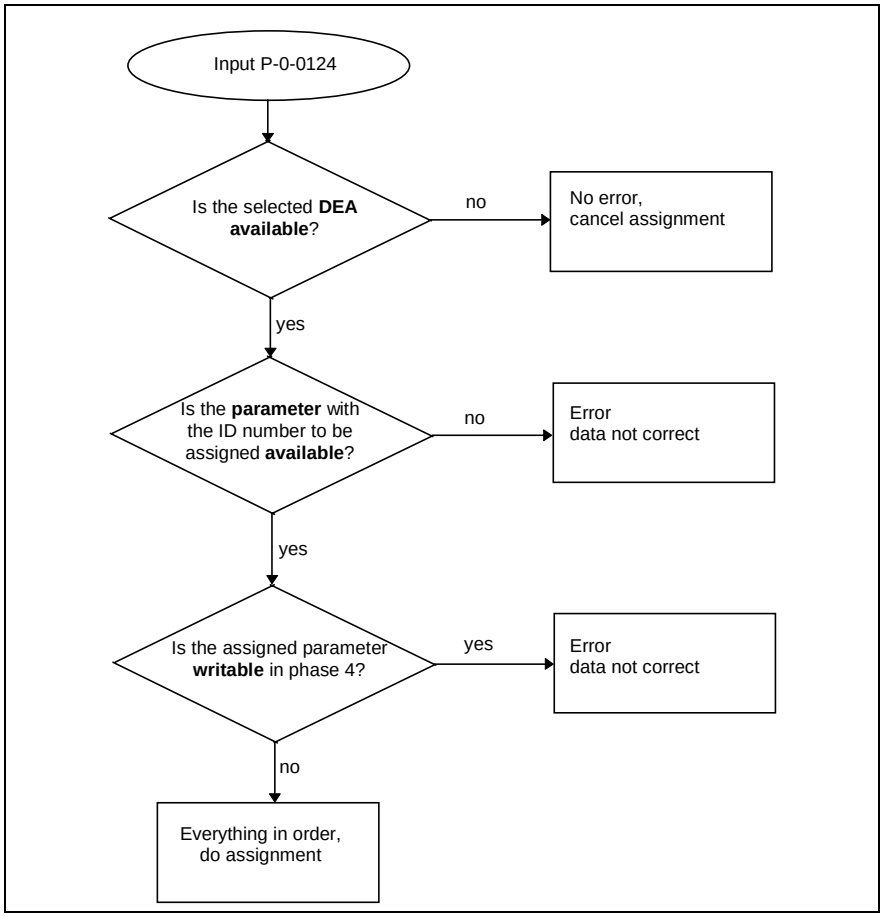


Fig. 8-13: Checks during input of the Parameter P-0-0125, Assignment DEA-Input -> IDN

8.4 Oscilloscope Feature

The oscilloscope feature is used to diagram internal and external signals and output variables. Its function is comparable to a simple 2-channel oscilloscope. The following parameters are available to set the oscilloscope feature:

- **P-0-0021, List of Scope Data 1** (always 4-byte data)
- **P-0-0022, List of Scope Data 2** (always 4-byte data)
- **P-0-0023, Signal Select Scope Channel 1**
- **P-0-0024, Signal Select Scope Channel 2**
- **P-0-0025, Trigger Source**
- **P-0-0026, Trigger Signal Selection**
- **P-0-0027, Trigger Level for Position Data**
- **P-0-0028, Trigger Level for Velocity Data**
- **P-0-0029, Trigger Level for Torque/Force Data**
- **P-0-0030, Trigger Edge**
- **P-0-0031, Timebase**
- **P-0-0032, Size of Memory**
- **P-0-0033, Number of Samples after Trigger**
- **P-0-0035, Delay from Trigger to Start** (cannot be written)
- **P-0-0036, Trigger Control Word**
- **P-0-0037, Trigger Status Word**
- **P-0-0145, Expanded Trigger Level**
- **P-0-0146, Expanded Trigger Address**
- **P-0-0147, Expanded Signal K1 Address**
- **P-0-0148, Expanded Signal K2 Address**
- **P-0-0149, List of selectable signals for oscilloscope function**
- **P-0-0150, Number of valid Samples for Oscilloscope Function**

Main Functions of the Oscilloscope Feature

The oscilloscope feature can be activated with the parameter **P-0-0036, Trigger Control Word** by setting bit 2. From then on, all data will be recorded that were selected through the parameters **P-0-0023, Signal Selection Channel 1** and **P-0-0024 Signal Selection Channel 2**. The selection will be defined with numbers that are assigned to various signals.

The triggering is activated by setting the bit 1 in the "Trigger Control Word" parameter. The trigger conditions can be set with the parameters **P-0-0025, Trigger Source, P-0-0026, Trigger Signal Selection** and **P-0-0030 Trigger Edge**. The signal amplitude that releases the trigger can be set with the parameters **P-0-0027 - P-0-0029 Trigger Level**.

If a trigger event is recognized, the number of values in the parameter **P-0-0033 Number of Samples after Trigger** will be recorded, and the function will end. Parameters **P-0-0031 Timebase** and **P-0-0032 Size of Memory** can define the recording duration and the time intervals for the measurement samples.

The sampled values are stored in the **P-0-0021 and P-0-0022 List of scope data** and can be read by the control.

Parameterizing the Oscilloscope Feature

Oscilloscope feature with defined recording signals

Preset signals and state variables can be selected through the **P-0-0023 and P-0-0024 Signal Selection** Parameters. The selection can be made by entering the signal number (hex format) in the corresponding signal selection parameter. The selected signal number defines the unit of data stored in the list of scope data. The following signals are predefined with numbers.

Number:	Signal selection:	Unit of the probe value list:
0x00	Channel not activated	--
0x01	Actual **position** feedback value dependent on operating mode S-0-0051 or S-0-0053	dependent on position scaling
0x02	**Velocity** feedback value Parameter (S-0-0040)	velocity scaling dependent
0x03	**Velocity control deviation** (S-0-0347)	velocity scaling dependent
0x04	**Following error** Parameter (S-0-0189)	dependent on position scaling
0x05	**Torque/Force command** value Parameter S-0-0080	Percent
0x06	not yet used	

Fig. 8-14: Selection of predefined signals

The parameter **P-0-0149, Signal Selection List for Oscilloscope Feature** was introduced so the control can recognize if the number of preset numbers changes. The parameter is structured as a list parameter and transmits the ID numbers of possible signals.

List entries:	ID number from:
1	S-0-0051 or S-0-0053
2	S-0-0040
3	S-0-0347
4	S-0-0189
5	S-0-0080
6	S-0-0051
7	S-0-0053
8	P-0-0147
9	P-0-0148

Fig. 8-15: Parameter P-0-0149 Occupancy

Expanded Oscilloscope Recording Function

In addition to the oscilloscope feature with preset signals, DIAX also allows for recording of any desired internal signals. Use of this feature is meaningful only with information about the structure of the internal data memory; therefore, this feature can be used effectively only by the corresponding developer. The feature can be activated with the **Signal Selection P-0-0023 & P-0-0024** parameters by setting bit 12 = "1". The format for the data to be saved can be defined with bit 13.

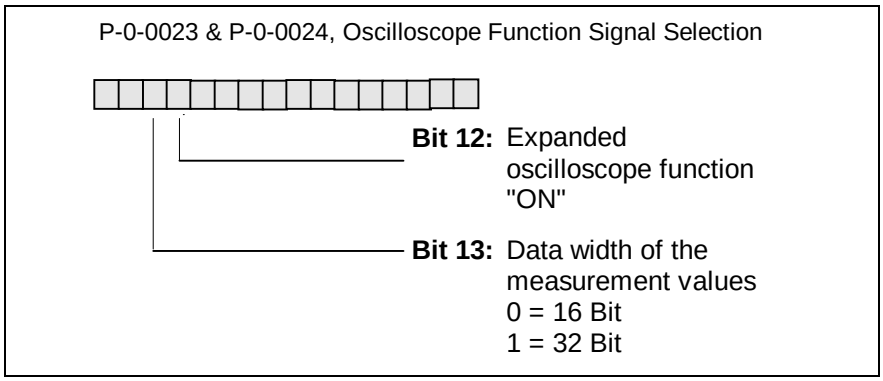

P-0-0023 & P-0-0024, Oscilloscope Function Signal Selection
Bit 12: Expanded oscilloscope function "ON"
Bit 13: Data width of the measurement values
0 = 16 Bit
1 = 32 Bit

Fig. 8-16: Structure of Parameters P-0-0023 and P-0-0024

If the expanded signal selection is parameterized, then the desired signal address can be defined in the parameters **P-0-0147, Expanded signal K1 address** and **P-0-0148, Expanded signal K1 address**. During recording, the contents of the selected addresses are saved in the lists of scope data.

Note: If a 16-bit data width is selected, then the signal data will be stored as sign-extended 32-bit values.

Oscilloscope Feature Trigger Source

With the **P-0-0025 Trigger Source** parameter, you can choose between two trigger types.

External trigger (P-0-0025 = 0x01)

The trigger is activated by the control through bit 0 in the **Trigger Control Word**. This makes it possible to transmit a trigger event to several drives. This parameterization supports parameter P-0-0035, which is necessary to visualize the recording data.

Internal trigger: (P-0-0025 = 0x02)

Triggering occurs through the monitoring of the parameterized trigger signal. If the selected edge is recognized, then the trigger will be released. The "Delay from Trigger to Start" parameter will be set to zero.

Selection of Trigger Edges

Various trigger edges can be selected with the parameter **P-0-0030 Trigger Edge**. The following options are available:

Number:	Trigger Edge:
0x01	Triggering on the positive edge of the trigger signal
0x02	Triggering on the negative edge of the trigger signal
0x03	Triggering on both the positive and negative edge of the trigger signal
0x04	Triggering when the trigger signal equals the trigger level

Fig. 8-17: Trigger edge selection

Selection of Fixed Trigger Signals

The parameter **P-0-0026 Trigger Signal Selection** determines the signal that is monitored for the parameterized edge reversal. Just as for the signal selection, there are drive-internal fixed trigger signals for the trigger signal selection. These are activated by entering the corresponding number.

The following signal numbers are possible:

Trigger signal number:	Trigger signal:	Associated trigger edge:
0x00	no trigger signal	not defined
0x01	Actual **position** feedback according to active operating mode	Position data (P-0-0027)
0x02	**Velocity** feedback value Parameter S-0-0040	Velocity data (P-0-0028)
0x03	**Velocity deviation** Parameter S-0-0347	Velocity data (P-0-0028)
0x04	**Following error** Parameter S-0-0189	Position data (P-0-0027)
0x05	**Torque command** value Parameter S-0-0080	Torque data (P-0-0029)

Fig. 8-18: Selection of fixed trigger signals

Selection of Expanded Trigger Signals

In addition to a trigger signal selection with preset signals, DIAX also allows for triggering on any desired internal signal. Use of this feature is meaningful only with information about the structure of the internal data memory; therefore, this feature can be used effectively only by the corresponding developer. This feature can be activated with the **P-0-0026 Trigger Signal Selection** parameter by setting bit 12 to 1.

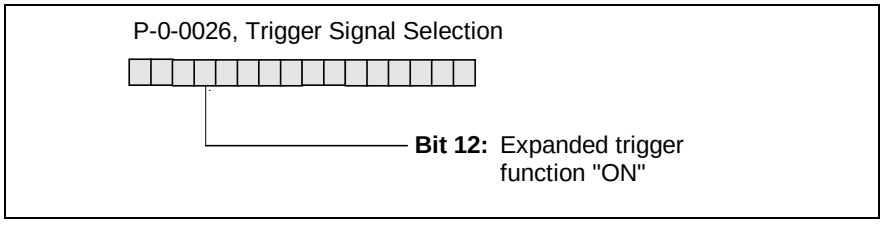


Fig. 8-19: Structure of parameter P-0-0026

If the expanded trigger feature is activated, then the trigger signal address must be defined via the parameter **P-0-00146 Expanded Trigger Address**. The associated trigger level is entered in the parameter **P-0-0145 Expanded Trigger Level**. This parameter is defined as follows:

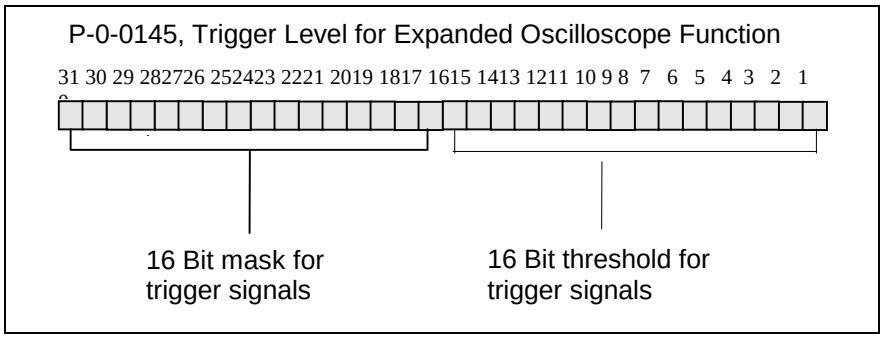

P-0-0145, Trigger Level for Expanded Oscilloscope Function
31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
0
16 Bit mask for trigger signals
16 Bit threshold for trigger signals

Fig. 8-20: Structure of parameter P-0-0145

The 16-bit value of the trigger edge is monitored, and the trigger signal will be ANDed with the trigger signal screen mask.

Setting the Time Resolution and the Memory Depth

The recording ranges for the oscilloscope feature can be defined with the parameters **P-0-0031 Timebase** and **P-0-0032 Size of Memory**. The maximum memory depth is 512 samples. If you need fewer samples, you can chang the value in the memory size parameter.

The time resolution can be set from 250 µs to 100 ms in steps of 250 µs. This determines the time intervals in which the samples are recorded. The minimum recording duration is 128 ms; the maximum recording duration is 51.2 s.

In general:

$$\text{Recording duration} = \text{Time resolution} \times \text{Size of Memory} \left[\mu s\right]$$

Fig. 8-21: Determining of the recording duration

Setting the Trigger Delays

By setting the parameter **P-0-0033 Number of Samples after Trigger**, it is possible to record probe values before the trigger event (trigger delay function of an oscilloscope). The setting occurs in units of the parameterized time resolution. The input value determines the number of probe values still recorded after a trigger event. By entering 0 • [time resolution], only data available before a trigger event will be recorded. If the value of the P-0-0032 Size of Memory parameter is entered, then only the probe values occurring after the trigger event will be recorded.

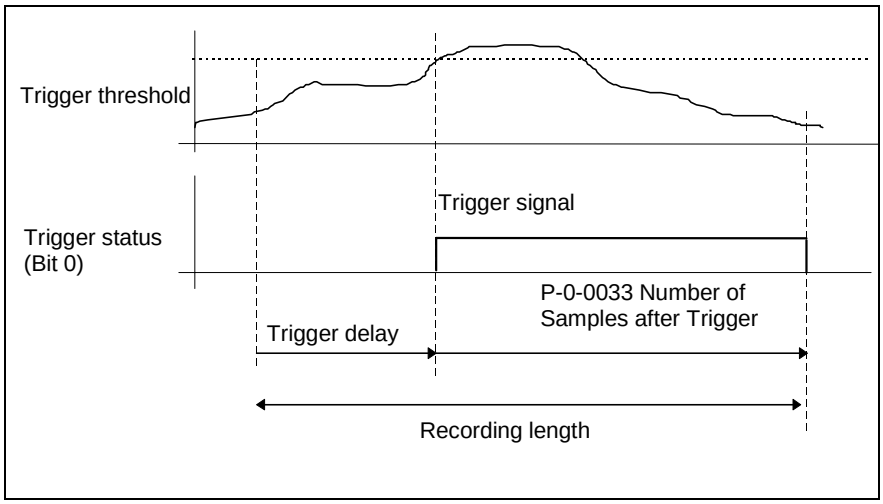


Fig. 8-22: Trigger delay - Number of samples after trigger

Activating the Oscilloscope Feature

The oscilloscope feature can be activated with the parameter **P-0-0036 Trigger Control Word**. The parameter is defined as follows:

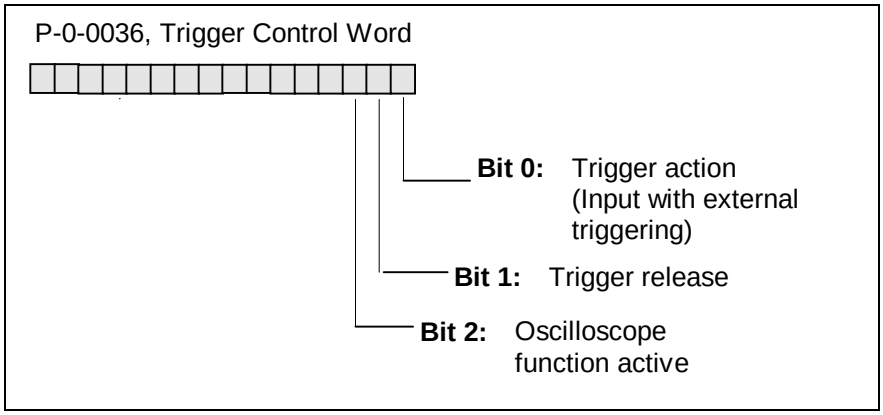


Fig. 8-23: Structure of Parameter P-0-0036

The oscilloscope feature is activated by writing bit 2 with "1"; i.e. the internal probe value memory is continually written with the selected measurement signals. If bit 1 is set, then the trigger monitor is activated, and the oscilloscope feature waits for the selected edge to occur. If a valid edge is recognized, then the probe value memory will be completed as set in parameter P-0-0033, and the oscilloscope feature will be deactivated by resetting bits 1 & 2 in the trigger control word.

Oscilloscope Feature With External Trigger and Internal Trigger Condition

If triggering is selected in parameter **P-0-0025 Trigger Source** with the control bit of the trigger control word, then the trigger will be initiated with the 0→1 (rising) edge of bit 0 in the trigger control word.

With this drive, it is also possible to monitor a trigger signal for the trigger condition. If the trigger condition is recognized, then bit 0 will be set in the trigger status, but it won't trigger. In this way, it is possible to signal the trigger event for several drives simultaneously with the real-time status and control bits via the control and to release the trigger .

Since there is a delay between the recognition of the trigger event and enabling the trigger, the delay is measured by the drive controller and stored in the parameter **P-0-0035, Delay from Trigger to Start**. A time-correct display of the signal can be guaranteed by using this parameter for the visualization of the probe values.

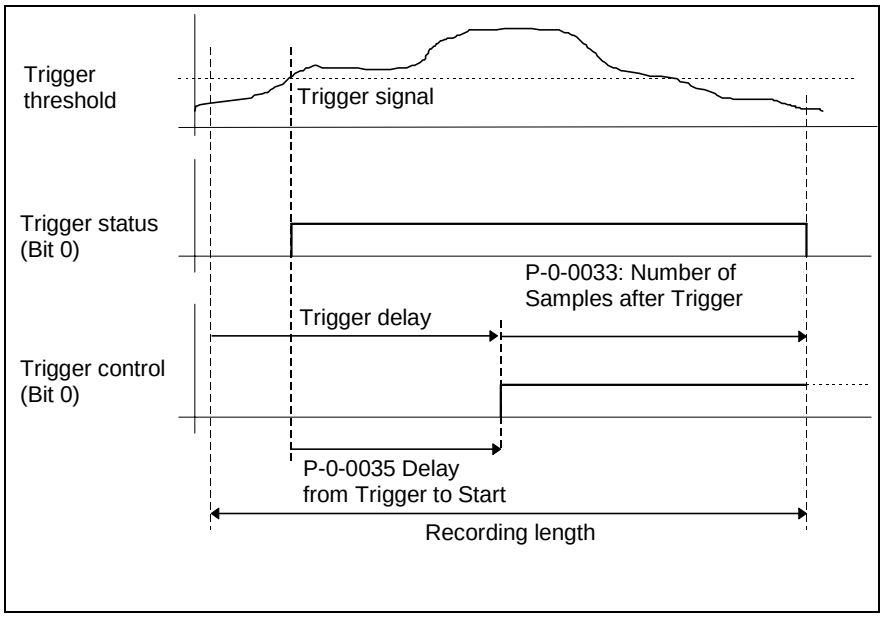


Fig. 8-24: Delay from trigger to start

Status Messages for the Oscilloscope Feature

Information about the status of the oscilloscope feature is shared with the control through the parameter **P-0-0037, Trigger Status Word**.

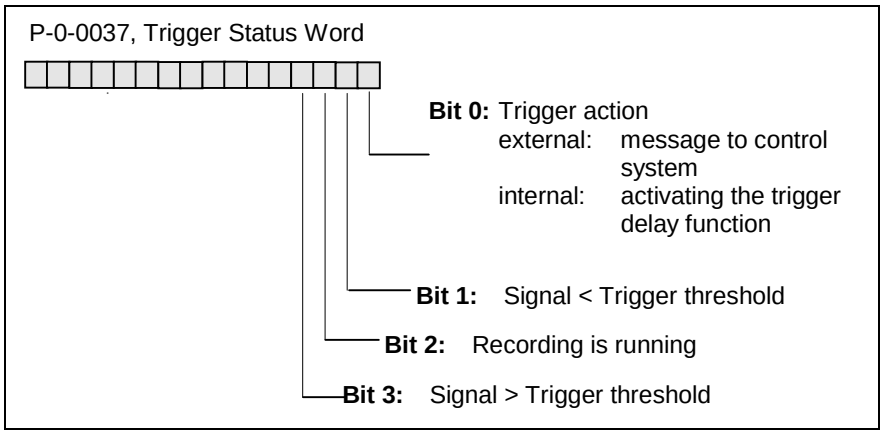


Fig. 8-25: Structure of Parameter P-0-0037

Number of Valid Probe Values

As soon as bit 2 is set by the **P-0-0036, Trigger Control Word**, the drive starts to record probe values.

If the trigger event is recognized after the bit is set, the oscilloscope feature records the number of samples after the trigger event and then stops recording.

The total probe value memory for the current measurement will not always be written, dependent on the memory size setting, the time resolution, the number of samples after trigger and the time when the trigger event occurs.

That means that the memory can contain samples which are not valid for the measurement.

The parameter **P-0-0150, Number of valid Samples** indicates the number of valid samples for the current recording.

8.5 Probe Input Feature

For position and time measurements using two binary input signals, there are two probe inputs on the communication control module DSS 2.1 that can be used to measure

- the position feedback value 1/2 or
- the relative internal time in [µs]

Measurements are made at a time defined by the signal edges on the two inputs.

Note: The sampling of the probe inputs occurs every 1 µs. The measurement signal actual feedback value 1 or 2 is generated every 250 µs. Between these samplings, linear interpolation is done with a precision of 1 µs.

You can read the absolute values of these signals at the time of a positive or negative edge as well as their difference by parameters.

The following parameters are available for the feature:

- **S-0-0170, Probing Cycle Procedure Command**
- **S-0-0401, Probe 1**
- **S-0-0402, Probe 2**
- **S-0-0169, Probe Control Parameter**
- **P-0-0200, Signal Select Probe 1**
- **P-0-0201, Signal Select Probe 2**
- **S-0-0405, Probe 1 Enable**
- **S-0-0406, Probe 2 Enable**
- **S-0-0130, Probe Value 1 Positive Edge**
- **S-0-0131, Probe Value 2 Negative Edge**
- **S-0-0132, Probe Value 2 Positive Edge**
- **S-0-0133, Probe Value 2 Negative Edge**

- **P-0-0202, Difference Probe Values 1**
- **P-0-0203, Difference Probe Values 2**
- **S-0-0409, Probe 1 Positive Latched**
- **S-0-0410, Probe 1 Negative Latched**
- **S-0-0411, Probe 2 Positive Latched**
- **S-0-0412, Probe 2 Negative Latched**

Main Function of the Probe Analysis

S-0-0170, Probing Cycle Procedure Command activates the feature. The feature is activated as a command, but does not send a command acknowledgment. The Command Change (KÄ) bit is not used.

To activate the feature, S-0-0170 must be written with 3 (decimal) = 11 binary.

From this point on, the status of the probe signals will be displayed in the parameters **S-0-401, Probe 1** and **S-0-402, Probe 2**.

A probe input is enabled with parameter **S-0-0405, Probe 1 Enable** or **S-0-0406, Probe 2 Enable**. With a 0-1 switch of the signal, the trigger mechanism is activated to evaluate the positive and/or negative edge of the probe signal.

From this point on, when a probe signal edge is recognized, the selected signal will be stored in the positive or negative probe value parameter. At the same time, the difference between the positive probe value and the negative probe value will be computed and saved in the probe value difference parameter. The following status messages will be set to 1: **S-0-0409, Probe 1 Positive Latched** and **S-0-0410, Probe 1 Negative Latched** or **S-0-0411, Probe 2 Positive Latched** and **S-0-0412, Probe 2 Negative Latched**.

When the probe enable is cancelled, the following status messages will be erased: S-0-0409, Probe 1 Positive Latched and S-0-0410, Probe 1 Negative Latched or S-0-0411, Probe 2 Positive Latched and S-0-0412, Probe 2 Negative Latched.

Note: Only the first positive and the first negative signal edge of the input will be evaluated after the 0→1 (rising) edge of the probe enable. For each new measurement, the probe enable must be reset to 0 and then to 1. When the probe enable is cancelled, the corresponding probe-value latched parameters are also cancelled.

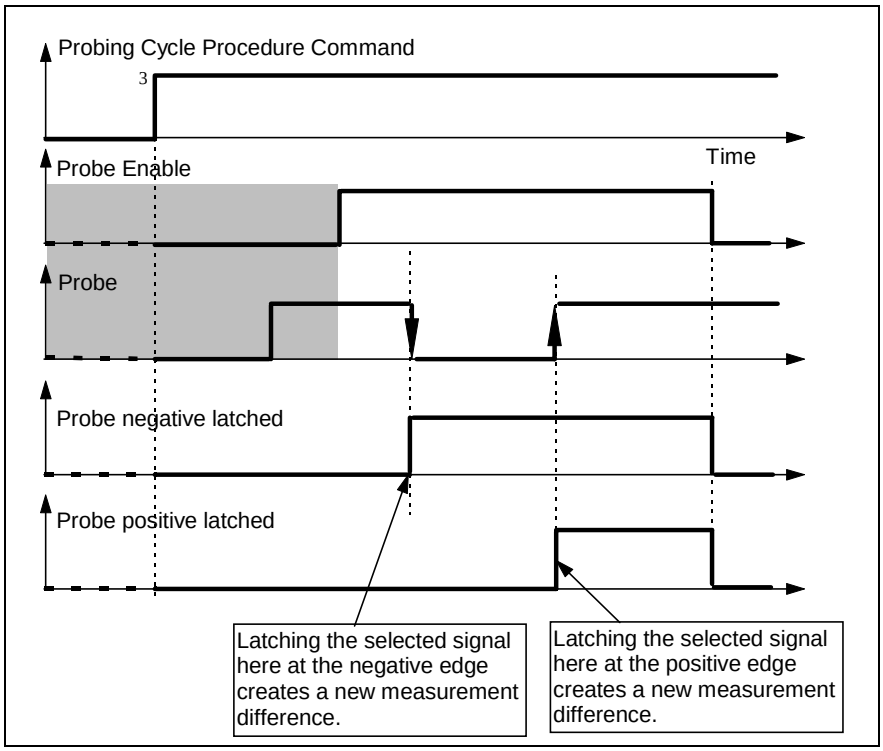

Probing Cycle Procedure Command
3
Time
Probe Enable
Probe
Probe negative latched
Probe positive latched
Latching the selected signal here at the negative edge creates a new measurement difference.
Latching the selected signal here at the positive edge creates a new measurement difference.

Fig. 8-26: Evaluation of probe signal edges, when positive and negative signal edge evaluation are set in the probe control parameter

Results of Writing "3" to the S-0-0170, Probing Cycle Procedure Command

The probe feature begins when 3 (decimal) = 11 binary is written into the parameter **S-0-0170, Command Probing Cycle Procedure**. The following will happen:

- The **data status** will be set to **7** by S-0-0170, Probing Cycle Procedure Command.
- All probe values and probe value differences will be set to 0.
- All "probe ... latched“ parameters will be cancelled.
- The external voltage monitor will be activated (if it has not yet been activated).

Signal Edge Selection for the Probe Inputs

A positive probe value and a negative probe value are available for every probe input. The positive probe value is assigned the 0→1 (rising) edge of the probe signal, and the negative probe value is assigned the 1→0 (falling) edge. The **S-0-0169, Probe Control Parameter** determines whether both occurring edges will be evaluated and will lead to the positive/negative probe values being saved.

The parameter should be set before activating this feature. The parameter is structured as follows:

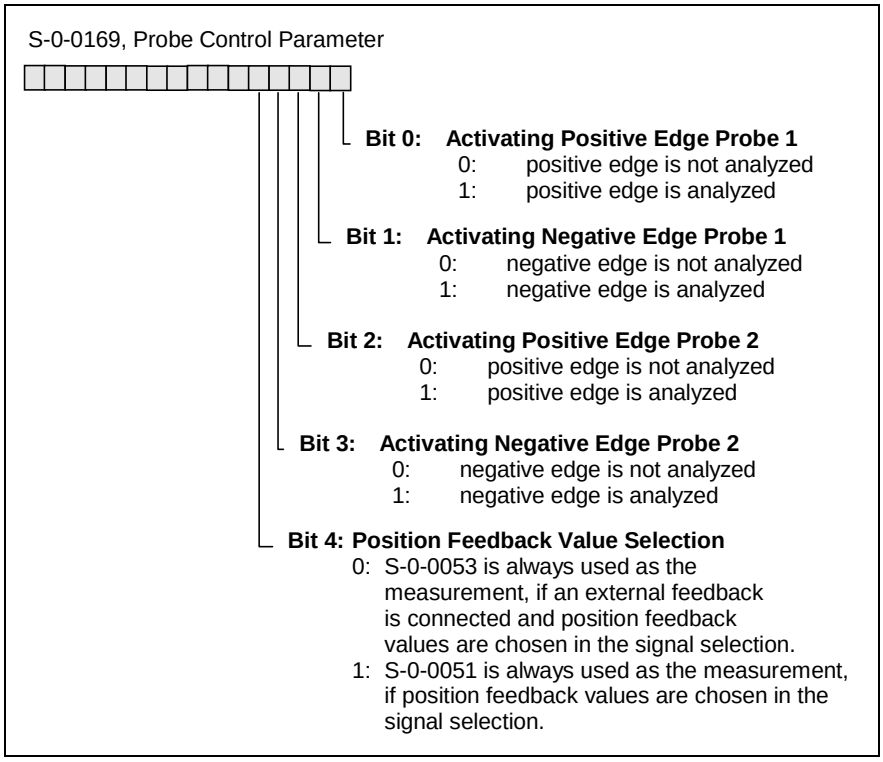

S-0-0169, Probe Control Parameter
Bit 0: Activating Positive Edge Probe 1
0: positive edge is not analyzed
1: positive edge is analyzed
Bit 1: Activating Negative Edge Probe 1
0: negative edge is not analyzed
1: negative edge is analyzed
Bit 2: Activating Positive Edge Probe 2
0: positive edge is not analyzed
1: positive edge is analyzed
Bit 3: Activating Negative Edge Probe 2
0: negative edge is not analyzed
1: negative edge is analyzed
Bit 4: Position Feedback Value Selection
0: S-0-0053 is always used as the measurement, if an external feedback is connected and position feedback values are chosen in the signal selection.
1: S-0-0051 is always used as the measurement, if position feedback values are chosen in the signal selection.

Fig. 8-27: Structure of Parameter S-0-0169, Probe Control

Signal Selection for the Probe Inputs

The following signals are available for measurement:

- Actual feedback value 1 (motor encoder)
- Actual feedback value 2 (external encoder, only if available)
- Internal time

The selection can be made with the parameters **P-0-0200, Signal Select Probe 1** and **P-0-0201, Signal Select Probe 2**, and with bit 4 of the **S-0-0169, Probe Control Parameter**.

In P-0-0200 and P-0201, you can indicate individually for the probe inputs whether a position feedback value or an internal time will be measured.

Value of P-0-0200/201:	Signal:
0	Actual **Position** feedback value 1/2
1	**Time**

Fig. 8-28: Signal determination for the probe feature

The units and decimal places of the positive, negative and difference probe value parameters will be switched depending on the selection made.

If the position feedback value is selected in the signal selection parameter, then bit 4 in the **S-0-0169, Probe Control Parameter** will determine whether **S-0-0051, Position Feedback 1** or **S-0-0053, Position Feedback 2** will be used as the signal.

Connecting the Probe Inputs

The probe can be connected to E4 or E5 at connector X12 on the DSS 2.1 plug-in module.

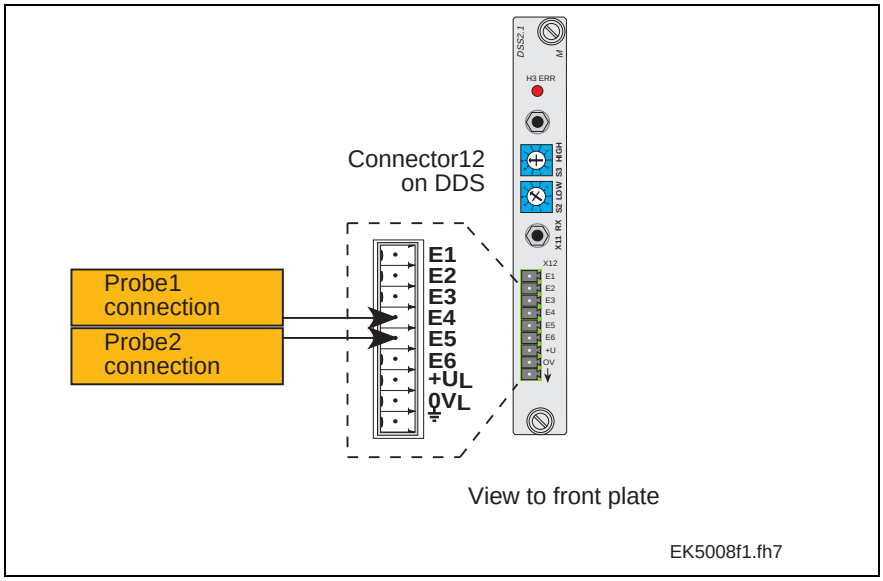


Fig. 8-29: Connecting the probes to the DSS

The following levels are valid for the probe inputs:

Low: 0..+6V

High: +14V..U_{ext}(max)

The inputs need an external power supply (with voltage U_{ext}) because they are electrically isolated.

The following applies:

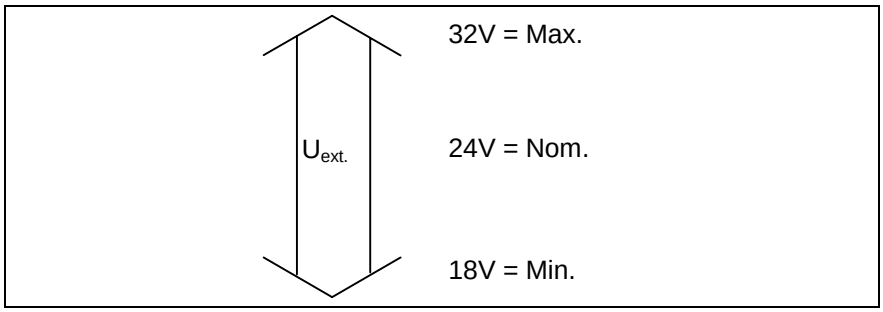


Fig. 8-30:Permissible input voltage range of the external power supply

If the external voltage is not in this range, then the error message:

F272 Error power supply probe input will be generated.

8.6 Positive stop drive procedure

The command **S-0-0149, d400 Positive stop drive procedure** turns off all controller monitors that would lead to an error message in Class 1 Diagnostics during the blocking of a drive during a fixed limit stop.

If the command is started, the drive generates the diagnostic message **D400 Positive stop drive procedure command**.

The controller monitors are switched off in all drive operating modes.

If there is a Class 1 Diagnostics error message at the start of the command, the error **D401 ZKL1-Error at command start** will be generated.

The drive will acknowledge the command as properly executed when:

- the controller monitors are switched off
- |Md| (S-0-0084) >= |Md_{Limit}| (S-0-0092) and
- $n_{feedback}$ = 0

Note: The message '$n_{feedback}$ = 0' is influenced by the parameter **S-0-0124, Standstill Window**.

If the command is cancelled by the control after execution, then all regular controller monitors are reactivated.

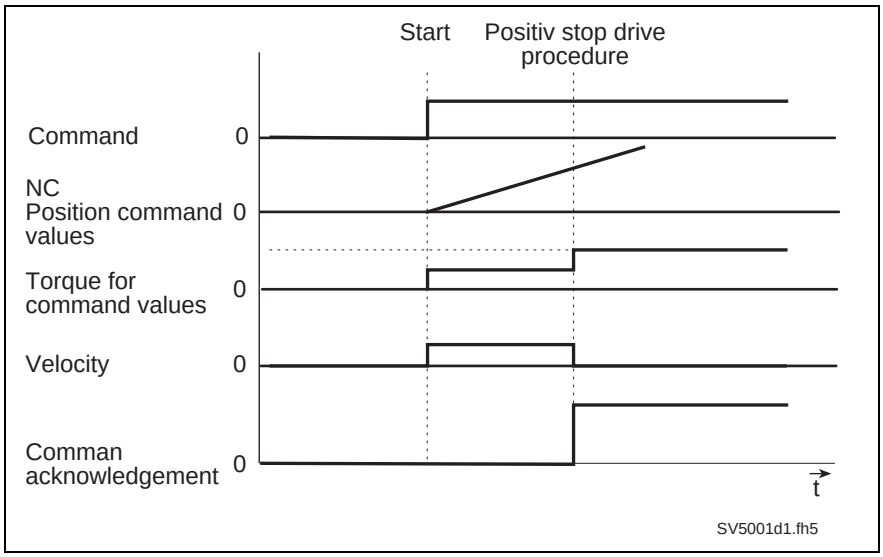


Fig. 8-31: Time sequence when activating the command: Positive stop drive procedure

8.7 Axis Error Correction

The axis error correction serves to correct systematic errors in the mechanical system and in the measurement systems of a servo axis. These systematic errors are classified as follows:

- Error resulting from thermal expansion of the machine elements
- Error resulting from inexactness in the measurement system
- Error resulting from mechanical inexactness in the gearbox, coupling and feed screw

The following correction features are available in the DIAX firmware to compensate for the errors:

- Reversal error correction
- Precision axis error correction
- Position-dependent temperature correction
- Position-independent temperature correction
- Axis error correction from the control

These correction features are independent of one another, and they can be combined in any combination needed. The resulting correction value indicates the sum of the individual correction values.

Note: All position-dependent correction features work only if the drive is referenced (homed).
Referencing can be done with the help of the drive-internal homing procedure.

Active Correction Value

Since it is possible to activate several correction features simultaneously, there are several correction values.

In parameter **P-0-0401, Pos. corr., active correction value** , all internally created correction values will be added and displayed in this parameter.

The created correction value refers to the encoder selected in the **S-0-0147, Homing Parameter** (Bit 3).

Reversal error correction

A backlash in the axis mechanism can be corrected easily with the reversal error correction.

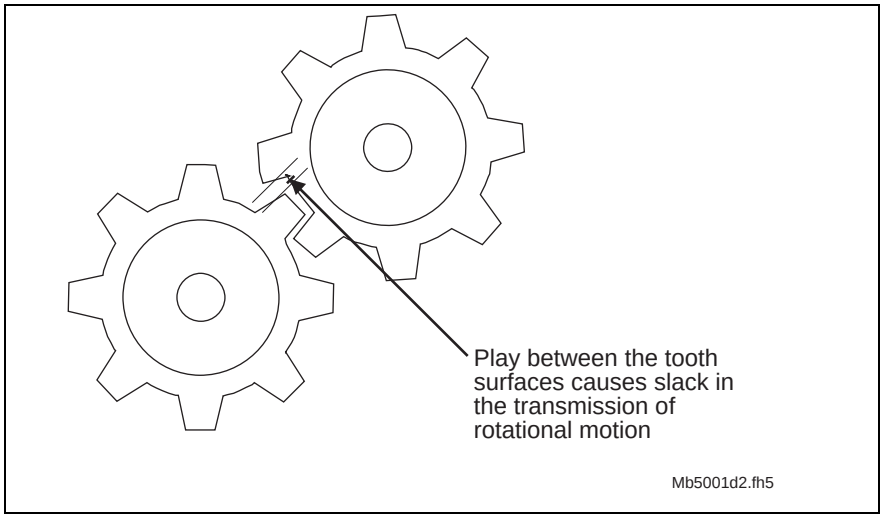


Fig. 8-30: Diagram of slack in gear

The feature can be activated by inputing the backlash in the parameter **S-0-0058, Reversal clearance.** The actual feedback value 1 (**S-0-0051, Actual Feedback Value 1**) is corrected with the parameterized correction value while taking into account the current command velocity (**S-0-0036, Velocity Command Value**).

The following applies:

For v(command) > standstill window (S-x-0124):
x1(actual feedback) = x1(actual feedback)
For v(command) < -standstill window (S-x-0124):
x1(actual feedback) = x1(actual feedback) + correction value

x1(actual feedback): actual position feedback value 1

Fig. 8-31:Influence of the actual position feedback during reversal error correction

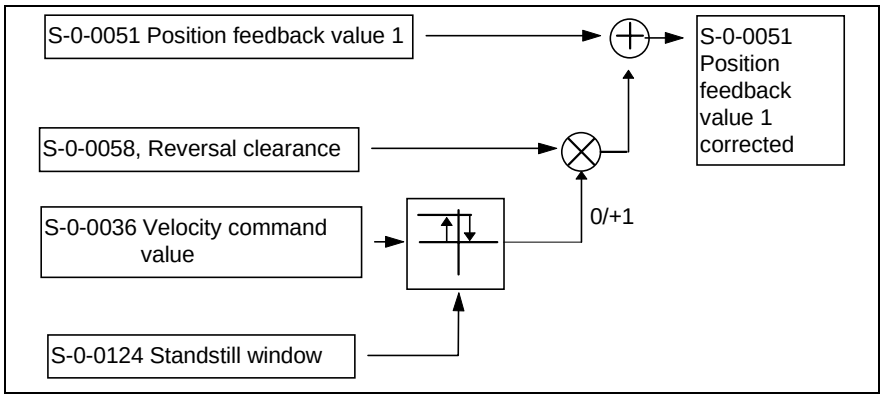


Fig. 8-32: Reversal error correction

Note: The actual feedback value of the motor encoder is corrected during reversal error correction.

Measuring the Reversal Play

The following procedure will determine the correct value for the parameter S-0-0058 Reversal clearance:

- Move axis in a positive direction in jog mode
- Put the measurement device to an appropriate point on the mechanical system of the axis and set it to zero.
- Jog the axis in a negative direction until a change can be seen in the pointer position of the measurement device.

Then, the following calculation determines the reversal clearance:

$$\text{Reversal clearance} = \Delta X\text{control} - \Delta X\text{meas}$$

ΔXcontrol: Path travelled according to control display
ΔXmeas: Path travelled according to measurement

Fig. 8-33: Calculating the reversal play

Precision Axis Error Correction

The precision axis error correction can be used to correct non-linear encoder errors and non-linear errors in the mechanical system.

The following parameters are available to set the correction:

- **P-0-0408, Pos. corr., prec. corr. start position**
- **P-0-0409, Pos. corr., correction table for prec. corr.**
- **P-0-0410, Pos. corr., support point distance for prec. corr.**

Main Function of the Precision Axis Error Correction

With the table **P-0-0409, Pos. corr., correction table for prec. corr.**, the position- and direction-dependent correction values, the so-called correction support points, can be defined within the correction range (correction range = start position + 499 • support point distance).

The positions from which the correction support points are taken can be defined with the parameters **P-0-0410, Pos. corr., support point distance for prec. corr.** and **P-0-0408, Pos. corr., prec. corr. start position**. The correction values are interpolated linearly between the correction support points.

If the axis is homed and if the parameters of the precision axis error correction are within the permissible limits, then the position feedback value of the homed encoder (selected with **S-0-0147, Homing Parameter, Bit 3**) will be corrected with the interpolated correction value (see Fig. after the next).

The feature can be deactivated by setting the **P-0-0410, Pos. corr., support point distance for prec. corr.** to zero.

The following applies:

$$\text{internal correction value} = xk(n) + m\{(x_{ist} - x_0) - n * d_S\}$$

with

$$n = \frac{(Xist - X0)}{ds} \qquad \text{(n with fractional part truncated)}$$

$$m = \frac{(xk(n+1) - xk(n))}{ds}$$

n : Table index
m : Interpolation factor
xk(n) : correction value at support point [mm or degrees]*
Xist : actual position value [mm or degrees]*
X0 : Start position [mm or degrees]*
ds : Support point distance [mm or degrees]*
* with preferred direction set in parameter S-0-0076

Fig. 8-34: Affecting the actual position value in terms of precision

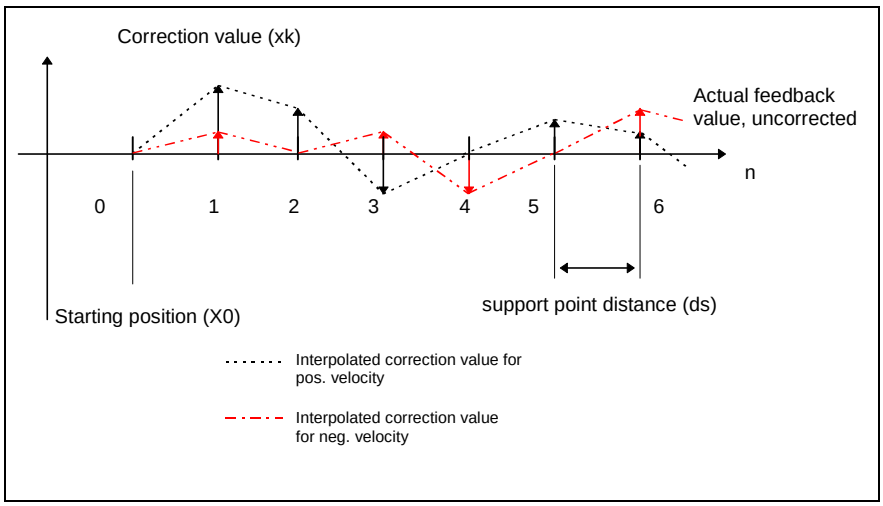


Fig. 8-35: Error correction with precision axis error correction

Note: If a faulty correction value is entered, then a leap in actual value can occur and cause a change in travel direction.

The following explains the input of the correction value in table form. The corrections made in a positive direction are listed in table index 0 to 499, those in a negative direction are in 500 to 999.

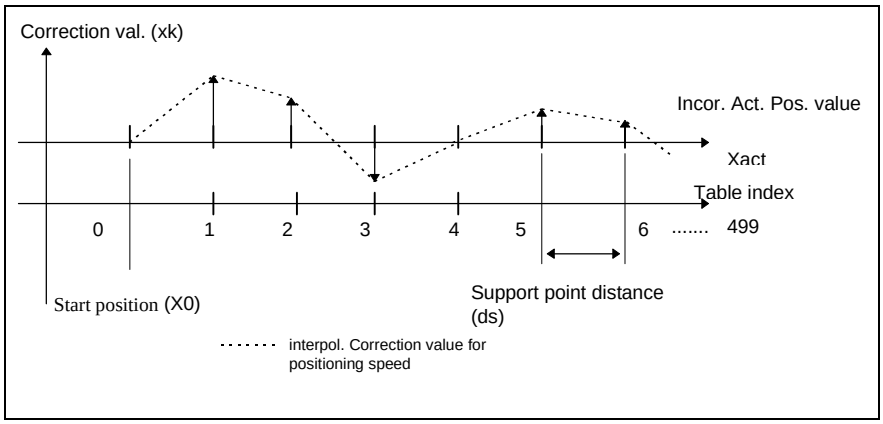


Fig. 8-36: Correction value for positive speed

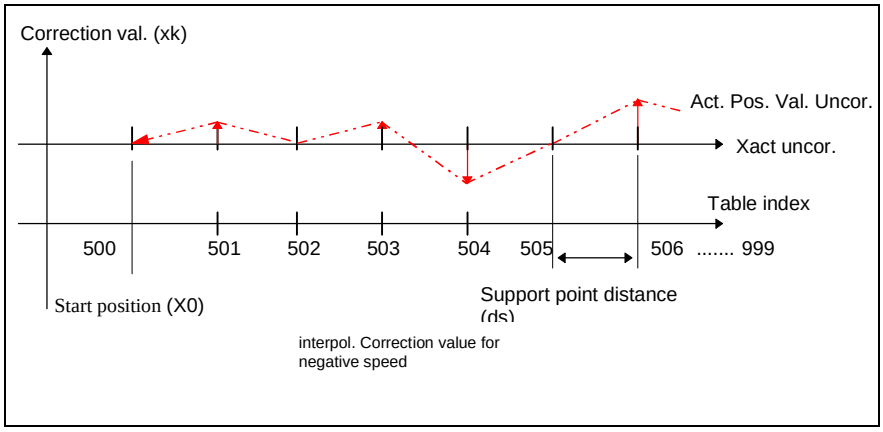


Fig. 8-37 Correction value for negative speed

Note: Different correction values for positive and negative directions lead to a leap with a change in direction of the relevant actual position value (selected with bit 3 in S-0-0147, homing parameter). This could also cause an immediate adjustment to the command position.

The principle of correction of the precision axis error correction is depicted below.

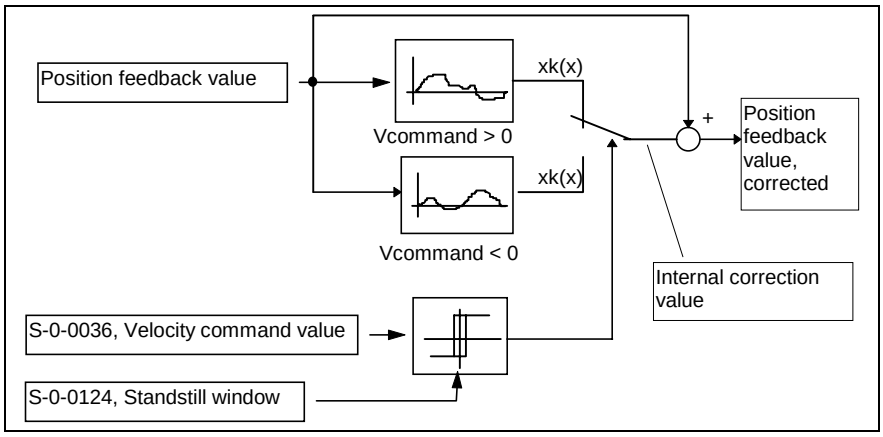


Fig. 8-38: Correction principle for precision corr.

Note: With precision axis error correction, the actual feedback value of the motor encoder or external encoder (dependent on S-0-0147, Homing Parameter) is corrected.

Determing the Correction Value

The correction table for the precision axis error correction consists of 2 • 500 correction values.

The first 500 corrections value are for the positive travel direction; the second 500 correction values are for the negative travel direction.

The correction values can be determined with a reference measurement system (i.e. laser interferometers). Within the desired correction range, the support points for the various directions are sequentially approached and the corresponding position errors are measured.

The following applies:

$$\text{error} = xk = x(\text{meas.}) - x(\text{display})$$

with:
xk : position error
x(meas.) : measured position value
x(display) : S-0-0051 or S-0-0053

Fig. 8-39: Correction value determination for precision axis error correction

This error is entered into the correction table as the correction value for the corresponding support point. If not all correction support points are needed, then the non-measured support points must be written with the correction value 0.

Note: To avoid jumps in feedback, the first (xk0,xk499) and the last (xk500,xk999) correction values must always be written with the correction value 0. The reference position (xs) must be selected accordingly.

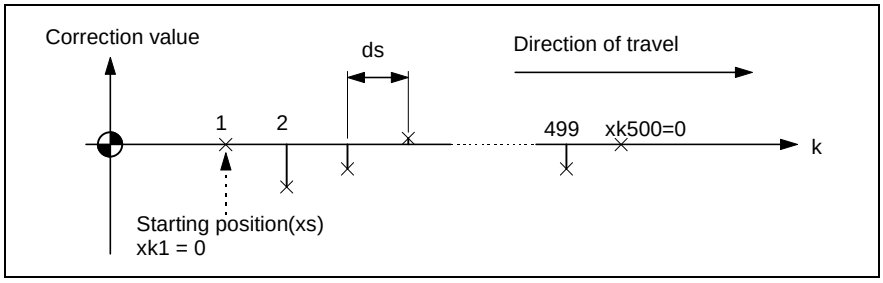


Fig. 8-40: Correction table for positive travel direction

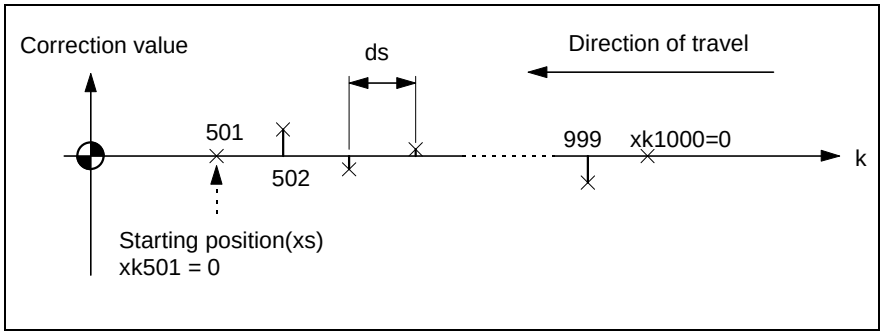


Fig. 8-41: Correction table for negative travel direction

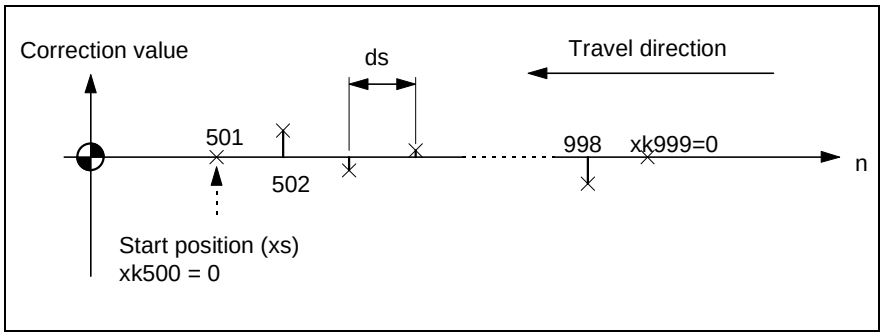


Fig. 8-42: Correction table for negative travel direction

Note: Actual value leaps with xk(pos) ≠ xk(neg).

Parameterizing the Support Point Distance

The parameter **P-0-0410, Pos. corr., support point distance for prec. corr.** can be used to define the correction range. Since a maximum of 500 support points per direction are possible, the correction range is determined by:

$$\text{correction range} = ds \times 499$$

with ds : Support point distance

Fig. 8-43: Determining the support point distance

If the parameter is set to 0, the precision axis error correction feature is deactivated.

Parameterizing the Start Position

The start position for the precision axis error compensation (xs) defines the position of the first correction support point.

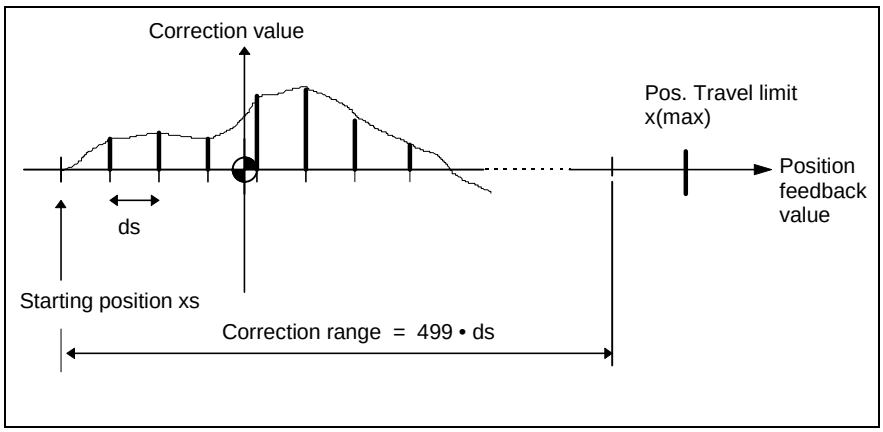


Fig. 8-44: Start position for precision correction

Temperature Correction

The temperature correction feature can be used to correct errors resulting from temperature-dependent longitudinal expansions on the servo axis.

There are two different correction types:

- Position-independent temperature correction
- Position-dependent temperature correction

Position-independent temperature correction

The expansion of these parts of a servo axis is always of equal size, independent of its position.

To set the position-independent temperature correction, the following parameters are available:

- **P-0-0402, Pos. corr., Reference temperature**
- **P-0-0405, Pos. corr., actual temperature, position independent**
- **P-0-0407, Pos. corr., temperature factor position independent [0.1/K]**

Position-dependent temperature correction

The **position-dependent** temperature correction is used to compensate for temperature-dependent longitudinal expansions of the mechanical system of a servo axis or a measurement system. The expansion of the mechanical system or the measurement system depends on the relative position of the workpiece referred to the thermal zero point, and it is not constant over the travel length.

To set the position-dependent temperature correction, the following parameters are available:

- **P-0-0402, Pos. corr., Reference temperature**
- **P-0-0403, Pos. corr., Reference position for temperature correction**
- **P-0-0404, Pos. corr., Actual temperature, position dependent**
- **P-0-0406, Pos. corr., Temperature factor, position dependent**

Position-Independent Temperature Correction

The correction value is determined with the parameter **P-0-0407, Pos. corr., temperature factor position independent [0.1/K]** and the **P-0-0402, Pos. corr., Reference temperature**. By writing 0 to the parameter **P-0-0407, Pos. corr., temperature factor position independent [0.1/K]**, the compensation is deactivated.

The following applies:

$$x_k = \alpha^* \times \Delta\vartheta$$

with:

Xk: internal correction value = P-0-0407, temp. factor position independent [mm or degrees]*

Lu: temperature deviation = (Ti - TO) [K]

a*: temperature correction factor [unit set in S-0-0076 x 0.1/K] (See determining position independent temperature correction factor)

*With preferred scaling set in parameter S-0-0076

Fig. 8-45: Influence of the position feedback value with position-independent temperature correction

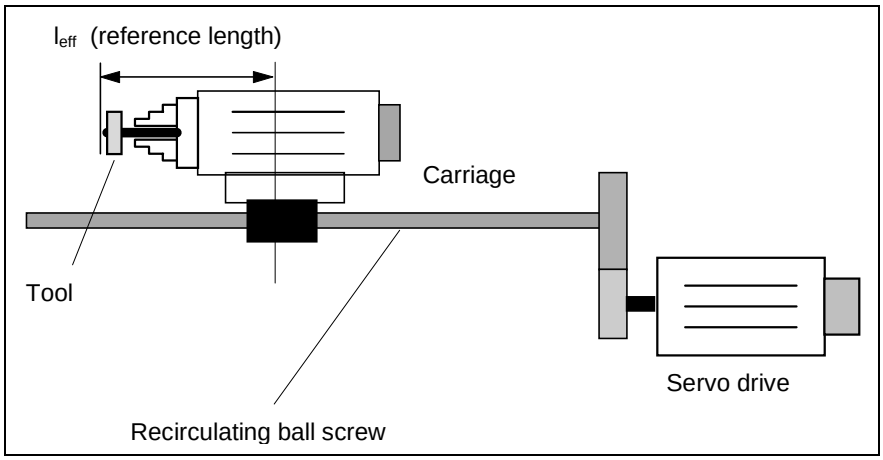


Fig. 8-46: Example of use for position-independent temperature correction

The following graphic shows the correction principle for the position-independent temperature correction.

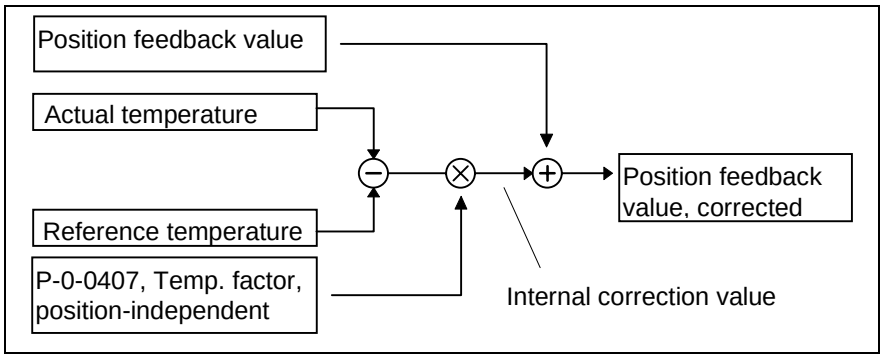


Fig. 8-47: Correction schematic for position-independent temperature correction

Homing the drive is not required to make the correction.

Note: The position-dependent temperature correction corrects the actual position value of the motor encoder or the external encoder, selected with bit 3 in the **S-0-0147 Homing Parameter**.

Position-Dependent Temperature Correction

If the drive is homed, the corresponding correction value (xk) is determined and added to the actual feedback value with the parameter **P-0-0406, Pos. corr., Temperature factor position dependent** (α), with the **P-0-0403, Pos. corr., Reference position for temperature correction** (x0) and with the **P-0-0402, Pos. corr., Reference temperature** (T0).

The following applies:

$$x_k = (x_{ist} - x_0) * (T_{ist} - T_0) * \alpha$$

with

xk	: internal correction value	[mm or degrees]*
xist	: actual position value	[mm or degrees]*
x0	: P-0-0403, reference position temp. corr.	[mm or degrees]*
T0	: P-0-0402, reference temp.	[°C]
α	: P-0-0406, temp. factor position-dependent	[1/K]
Tist	: actual temp.	[°C]

*With preferred scaling set in parameter S-0-0076

Fig. 8-48: Influence of the position feedback value for position-dependent temperature correction

This feature works only on the actual feedback value 1 and is deactivated by setting the parameter **P-0-0406, Pos. corr., Temperature factor position dependent** to 0.

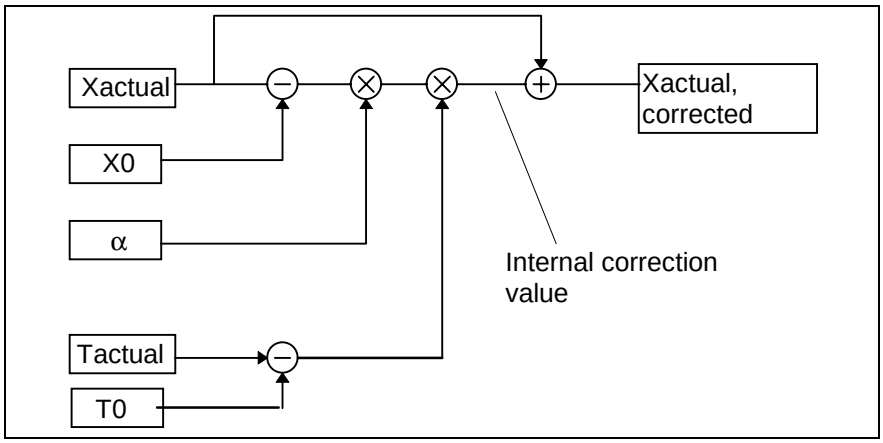


Fig. 8-49: Correction schematic: position-dependent temperature correction

Note: The actual feedback value of the motor encoder is corrected with the position-dependent temperature correction.

Parameterizing the Reference Temperature

To determine the correction values for temperature-dependent correction features, a reference temperature is needed to which the actual feedback temperatures **P-0-0404, Pos. corr., Actual temperature, position dependent**and **P-0-0405, Pos. corr., Actual temperature, position independent** can refer.

The parameter **P-0-0402, Pos. corr., Reference temperature** determines the temperature at which the temperature-dependent axis error equals 0 independent of the position.

Requirement:

When setting the reference temperature, all machine parts included in the correction must be at the same temperature.

Determining the Reference Position for position-dependent Temperature Correction

The parameter **P-0-0403 Pos. corr., Reference position for temperature correction** defines for position-dependent correction types the position at which the axis error is always 0.

It is compensated from the reference position in both directions.

Metrological determination

If the reference position is not clearly defined by the mechanical system, then the determination will be made through measurement. In this procedure, the position-dependent errors will be measured over three measurement points in the entire travel range at a known temperature different from the reference temperature.

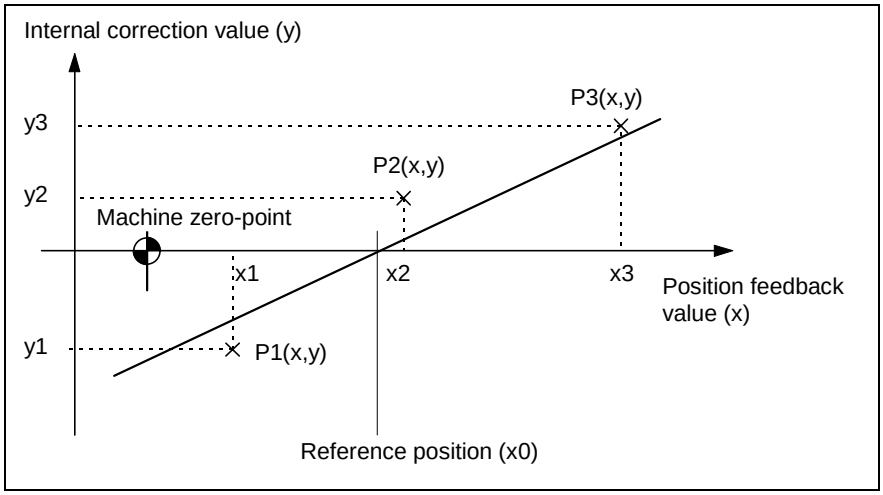


Fig. 8-50: Display of the reference position

With the measurement points (P1, P2, P3) the reference point can be determined with a mean straight line.

Calculating the Mean Straight Line

The following applies:

$$\text{Reference position} = \frac{-b}{a}$$

Fig. 8-51: Equation to determine the reference position

with:

$$a = \frac{n \times \sum (x_{ist} \times x_k) - \sum x_{ist} \times \sum x_k}{n \times \sum x_{ist}{}^2 - (\sum x_{ist})^2}$$

with
n : Number of measured values
xist : actual position of a measured value
xk : correction value of a measured vaue

Fig. 8-52: Equation 1 for determining reference points

$$b = \frac{\sum x_k \times \sum x_{ist}{}^2 - \sum x_{ist} \times \sum (x_{ist} + x_k)}{n \times \sum x_{ist}{}^2 - (\sum x_{ist})^2}$$

Fig. 8-53: Equation 2 to determine reference point

Example

Error measured at: Tact = 45°C and T0 = 23°C;

n	x(actual feedback value 1) [mm]	xk(error) [mm]
1	+10.0000	-0.0300
2	+70.0000	+0.0100
3	+105.0000	+0.0250

Fig. 8-1: Established measurement array for temperature correction

Resulting measurement points: P = [X = Xist ; X = xk]

P1 = [+10.0mm; -0.03mm]

P2 = [+70.0mm;+0,01mm]

P3 = [+105.0mm;+0,025mm]

n = 3

Intermediate sum for help equations:

$$\sum y = -0.03 + 0.01 + 0.025 = +0.005$$

$$\sum x = 10.0 + 70.0 + 105.0 = 185.0$$

$$\sum x^2 = 10^2 + 70^2 + 105^2 = 16025$$

$$\sum x \times y = -0.3 + 0.7 + 2.625 = 3.025$$

Help equation 1:

$$a = \frac{3 * 3.025 - 185.0 * 0.005}{3 * 16025 - (185.0)^2} = \frac{8.15}{13850} = 0.0005884$$

Help equation 2:

$$b = \frac{0.005 * 16025 - 185.0 * 3.025}{3 * 16025 - (185.0)^2} = \frac{-479.5}{13850} = -0.034620$$

Reference position:

$$x0 = \frac{-(-0.034620)}{0.0005884} = 58.83\,mm$$

To determine the reference position as exactly as possible, several measurement arrays with differing temperatures should be collected during position-dependent temperature correction.

The resulting reference position is determined from the arithmetical average of the various reference positions.

Setting the Position-Dependent Temperature Correction Factors

The parameter **P-0-0406, Pos. corr., Temperature factor position dependent** indicates the longitudinal expansion of the spindle. The correction factor can be taken directly from table books for corresponding mechanical systems or, if necessary, it must be determined with measurements of the longitudinal expansion at various temperatures.

Metrolological determination

To determine the factor, the measurement array for determining the reference position can be used.

The sizes a and b from there determine the longitudinal expansion factor according to the following equation and are used by the drive to determine the linearized position error xk'.

$$\beta^* = \frac{a \times x + b}{(x - x0) \times (\vartheta 1 - \vartheta 0)}$$

with:

a	: Result from help equation 1	
b	: Result from help equation 2	
x	: Position value	
x0	: Reference position	
β*	: length expansion factor = P-0-0406	[1/K]
Tist	: actual temperature	[°C]
To	: reference temperature	[°C]

Fig. 8-54: Equation to determine the longitudinal expansion factor

To ensure a factor as exact as possible, use various temperatures for your determination.

For each new temperature measurement array, the values of a and b must be newly determined.

The resulting longitudinal expansion factor is determined mathematically from the various longitudinal expansion factors.

Determining the Position-Independent Temperature Correction Factor

The position-independent temperature correction factor **P-0-0407, Pos. corr., Actual temperature, position independent (0.1/K)** can be determined in 2 different ways.

If all data can be allocated clearly through the structure of the mechanical system for the following formula, then the correction factor can be derived mathematically.

Mathematical Determination

The following applies:

$$\alpha^* = \alpha \times lx(T_0)$$

with:

α^*	P-0-0407, temp. factor position independent [unit set in S-0-0076 x 0.1/K]
α	length expansion coeficient of the material [1/K]
$lx(T_0)$:	compensating material length with reference temperature [unit set in S-0-0076]

Fig. 8-55: Equation to determine the position-independent temperature correction factor mathematically

Example: (with preferred scaling)

Brass α = 0.000018 $\times$ 1/K

lx = 100 mm

α^* = 0.000018 [1/K] $\times$ 100 mm

α^* = 0.0018 mm/K

Input value for P-0-0407, Pos. corr., temperature factor position independent [0.1/K] = 0.018 [0.1*mm/K].

Technical Measurement Determination

If you cannot determine the factor in a mathematical way, then you can get it from a measurement array. The error of the correction object is measured at various temperatures. The measurement array thus determined offers a mean straight line to determine the correction by approximation.

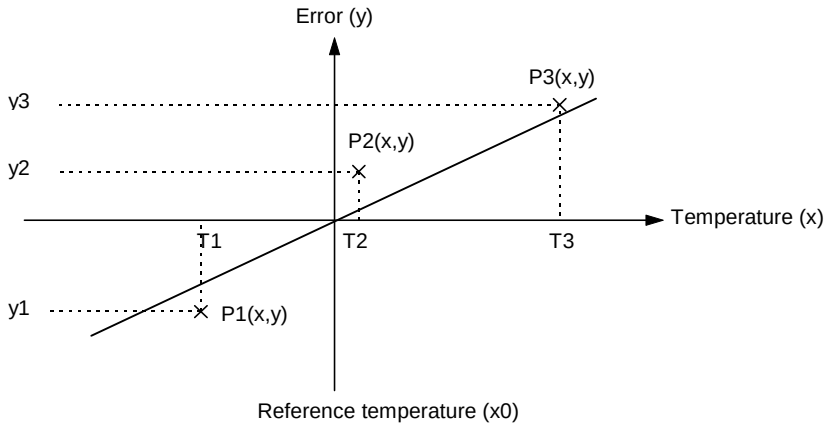


Fig. 8-56: Graphic of the mean straight line determined by measurement for the determination of the position-independent temperature factor

The following applies for the calculation of the correction factor α^*:

$$\alpha^* = \frac{n \times \sum (x_{ist} \times x_k) - \sum x_{ist} \times \sum x_k}{n \times \sum x_{ist}^{\,2} - (\sum x_{ist})^2}$$

with

α^*	: P-0-0407, temp. factor position indep.
n	: Number of measured values
xist	: actual position of measured value
xk	: correction value of a measured value

Fig. 8-57: Equation to determine the position-independent correction factor from the values of the mean straight line

Control Side Axis Error Correction

Since it is not possible to examine the axis alone for some applications, the control is given the option to cyclically add a correction value to the actual feedback value with the control axis error correction. The **P-0-0400 Pos. corr., external correction value** will be added to the actual feedback value with the **S-0-0147 Homing parameter** (Bit 3).

To use this correction feature, it is not necessary that the axis is homed.

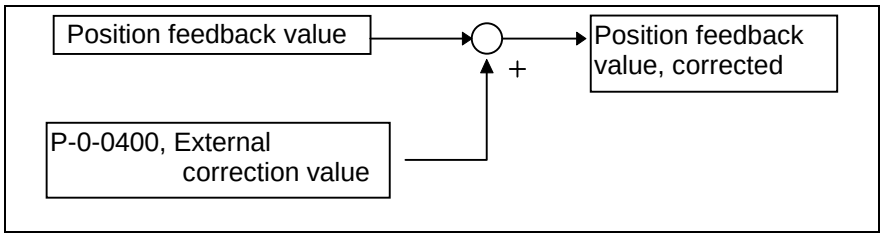


Fig. 8-58: Correction schematic: Control side axis error correction

Note: Given the correction of an axis error by the control, the actual position of the motor or external encoder (dependent on S-0-0147 homing parameter) is corrected.

8.8 Command - detect marker position

The command "Determine marker position" is used to check the correct detection of the reference markers of an incremental measuring system. This does not include an evaluation of the zero switch.

The following parameters are provided for this function:

- **S-0-0173, Marker position A**
- **P-0-0014, D500 Command determine marker position**

Functional principle of command detect marker position

Once the command **P-0-0014, D500 detect marker position** is activated, the following is done:

Only possible with incremental measuring systems

- The diagnosis **D500 detect marker position command** is generated.
- Check whether the encoder selected by bit 3 of **S-0-0147, Homing parameter** is an incremental measuring system. Incremental measuring systems are those connected via one of the encoder interfaces listed below. If this is not the case, then the command error message **D501 Incremental encoder required** is generated. The command cannot be executed any further.
- If an incremental measuring system is selected, then the detection of a reference marker is activated, and the drive waits for the next reference marker.
- If a reference marker is detected, then its position feedback value is stored in parameter **S-0-0173, marker position A.** This command is now signalled as completed.

Note: No command values are generated. The mode active at command start remains unchanged. To override the reference marker, the control must generate command values, e.g., by jogging.

Possible encoder interfaces of incremental measuring systems:

Encoder interface	Number
DLF01.1	2
DZF02.1	3
DEF011	5
DEF02.1	6
DZF03.1	9

Fig. 8-59: Possible encoder interfaces of incremental measuring systems

Additional uses of parameter "S-0-0173, Marker position A"

In parameter **S-0-0173, Marker position A**, the position of the reference marker is also stored during the command **S-0-0148, C600 command drive-controlled homing**. This relates, however, to the "old" coordinate system (before the coordinate system was switched while performing a homing function).

8.9 Command Parking Axis

The command "Parking Axis" supports the operational decoupling of an axis. This may, for example, be necessary if an axis is temporarily brought to a standstill. The start of the command switches off all monitoring functions of the measuring system and the control loops.

The following parameter is available for this function:

- **S-0-0139, D700 Command parking axis**

The functional principle of the command parking axis

Command can only be executed in parameter mode

The command can only be started in parameter mode (communications phases 2 or 3). Once **S-0-0139, D700 command parking axis** is started, the following is executed:

- The measuring system monitors ,
- the control loop monitors and
- the temperature monitors

are deactivated. The measuring system initializations are not executed in command **S-0-0128, C200 communications phase 4 transition check**. "**PA**" appears at the 7-segment display. The drive no longer accepts the drive enable signal.

All active commands in the drive are cancelled when switching the communications phases back. If this command was activated, followed by a progression into communications phase 4 (operating mode), then there is no need to cancel the command, as the cancelling is only possible in communications phases 2 or 3, and any phase regression will also inevitably cancel all commands.

9 Glossary

Data status

Every parameter has at its disposal a data status. It can be read by the control via the required data channel. The information on the validity of the parameter or the command acknowledgment of the command are contained therein.

Error reaction or response

If an error is detected in the drive, then the drive reacts independently by executing an error reaction. At the end of each error reaction there is a deactivation of the drive. The error reaction type is dependent on the error class of the error that occurred as well as the setting in parameters P-0-0117..119.

External encoder

An external measuring system is optional. It is generally mounted directly to the load. The actual feedback value of the encoder can be seen in S-0-0053, Actual feedback value 2. By activating the position control operating mode with encoder 2, the position control loop is closed with the help of the actual feedback value of the external encoder.

Load default or basic load

The control parameters are stored in the motor feedback data memory in both MDD and MKD motors. This makes it possible for the drive controller to work trouble-free with this motor. The control parameters have not been optimized for the application.

Modulo format

Both actual feedback and command values can be processed in modulo or absolute format. If modulo processing has been set, then the position data move within the range of 0..S-0-0103, modulo value. With this function, it is possible to realize an endlessly turning axis.

Motor encoder

The motor encoder is the measuring system that is used during commutation. A measuring system is absolutely necessary. The actual feedback value of the encoder can be seen in S-0-0051, Actual position value 1. By activating the position control operating mode with encoder 1, the position control loop is closed with the help of the actual position of the motor encoder.

Operating data

The operating data is data block element 7 of a parameter. The value of the parameter is stored there.

Operating mode

Operating mode is set in parameters S-0-0032..35. It determines in what way a command value is processed in the drive and eventually initiates an axis movement. The operating mode does not define how the command value reaches the drive.

Parameterization mode

The drive is in parameterization mode if communication phases 1..3 have been set. The drive cannot be activated (drive enable signal applied).

Operating mode must first be switched into. Some parameters can only be written into during parameterization mode.

Programming module

The programming module contains the software and parameter memory. It is mounted in slot U5. When exchanging the controller, a simple insertion of the programming module out of the old into the new unit means that the features of the replaced unit have been transferred to the new one.

Scaling

The combination of unit and number of decimal places of a parameter are defined as scaling. It can be set for position, velocity and acceleration data.

SERCOS-INTERFACE

Digital interface for communication between control and drives in numerically controlled machines. One or multiple ring structures are implemented. The physical connection of the participants generally implements a fiber optic cable.

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DIAX03
Drive With Servo Function

Supplement A
Parameter Description
SSE 02VRS

DOK-DIAX03-SSE-02VRS**-FKB1-EN-P

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1 General Information

Using This Manual

All standard and product specific parameters are listed in this chapter in a numerically ascending order.

This chapter supplements the feature description and represents a complete description of all parameters used in the DIAX03 software.

The description of the individual parameters is divided into two subsections.

1) General description
This section contains the feature or meaning of the parameter and tips for setting parameters.

2) Description of attributes

The characteristic values or features listed here help to classify the parameter. They are necessary for a complete description of the parameter. However, they are not required to get a general idea of the meaning of the parameter.

Definitions

The following abbreviations are used:

Data length:

2-byte - the data length for the operating data is 2 bytes.

4-byte - the data length for the operating data is 4 bytes.

1-byte variable - this is a piece of operating data of variable length (list). The length of a data unit is 1 byte.

2-byte variable - this is a piece of operating data of variable length (list). The length of a data unit is 2 bytes.

4-byte variable - this is a piece of operating data of variable length (list). The length of a data unit is 4 bytes.

Format:

BIN - the display format for the operating data should be binary.

HEX - the display format for the operating data should be hexadecimal.

DEC_OV - The display format for the operating data should be decimal without a sign.

DEC_MV - The display format for the operating data should be decimal with a sign.

ASCII - the operating data is an ASCII string.

IDN - the operating data is an ID number (IDN).

Editability:

No - the operating data cannot be edited.

P2 - The operating data can only be edited in communications phase 2.

P23 - The operating data can only be edited in communications phases 2 and 3.

P234 - The operating data can be edited in any communications phase.

P3 - The operating data can only be edited in communications phase 3.

P4 - The operating data can only be edited in communications phase 4.

Memory:

fixed - the operating data is programmed in the drive (fixed value).

no - The operating data is not buffered in the drive; the value is undefined after the drive controller is switched on.

Param. EE - The operating data is buffered in E²prom of the programming module (DSM).

Ampl. EE - The operating data is buffered in E²prom of the drive controller.

Feedb. EE - The operating data is buffered in the E²prom of the motor feedback data memory (only in MDD- and MKD motors).

Validity check:

no - the operating data is not checked for validity.

Phase2 - the operating data is checked in the "Communications phase 3 transition check" command.

Phase3 - the operating data is checked in the "Communications phase 4 transition check" command.

Extreme value check:

no - the operating data is not checked for its extreme values when it is written to.

yes - the operating data is checked for its extreme values when it is written to.

Combination check:

no - the operating data is not checked (bitwise) for a valid combination with other parameter values when it is written to.

yes - The operating data is checked (bitwise) for a valid combination with other parameter values when it is written to.

Cyc. transmittable:

no - The operating data cannot be configured as cyclical data in the master data telegram or in the drive telegram.

AT - The operating data can be configured as cyclical data in the drive telegram.

MDT - The operating data can be configured as cyclical data in the master data telegram.

Default Value:

The default value indicates the value of the parameter loaded into fixed memory with the current version of firmware installed on the drive following the PL program load command and prior to user edits or loading saved parameter files.

Notes

2 Standard Parameters

S-0-0001, NC Cycle time (TNcyc)

The NC cycle time indicates the time intervals between new command values being made available by the NC. The NC cycle time must be transmitted in communications phase 2 from the master to the slave; from communications phase 3 on it must be considered in the slave. The NC cycle time must be an integral multiple of **S-0-0002, SERCOS Cycle time (Tscyc)**.

$$T_{Ncyc} = T_{Scyc} \bullet j, \quad \text{where } j = 1,2,3...$$

See also the functional description: "Position command value monitoring".

S-0-0001 - Attributes

Para. Name:	**DE**	NC-Zykluszeit (TNcyc)		
	EN	NC Cycle time (TNcyc)		
	FR	Durée de cycle de la commande numérique (TNcyc)		
	ES	Tiempo de ciclo NC (TNcyc)		
	IT	Tempo Ciclo NC (TNcyc)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		500 / 65000		
Default value:		2000	**Cyc. transmittable:**	no

S-0-0002, SERCOS Cycle time (Tscyc)

The interface cycle time indicates the time intervals for cyclical data transfer. The interface cycle times are set to 500µs, 1ms, 2ms, ... to 65ms in increments of 1ms. The SERCOS cycle time must be transmitted from master to slave in communications phase 2; and from communications phase 3 on it must be activated in both.

See also the functional description: "Configuration of the telegram send and receive times".

S-0-0002 - Attributes

Para. Name:	**DE**	SERCOS-Zykluszeit (TScyc)		
	EN	SERCOS Cycle time (Tscyc)		
	FR	Durée de cycle de transmission SERCOS (TScyc)		
	ES	Tiempo de ciclo SERCOS (TScyc)		
	IT	Tempo Ciclo SERCOS (TScyc)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		500 / 65000		
Default value:		2000	**Cyc. transmittable:**	no

S-0-0003, Minimum AT transmit starting time (T1min)

The slave uses this parameter value to indicate the minimum time requirement between the end of the received master synchronization telegram and the transmission of the drive telegram.

The time $T1_{min}$ is read in communications phase 2 by the master to calculate the time to send the drive telegram T1 **S-0-0006, AT Transmission starting time (T1)**.

See also the functional description: "Configuration of the telegram send and receive times".

S-0-0003 - Attributes

Para. Name:	**DE**	Sende-Reaktionszeit AT (T1min)		
	EN	Minimum AT transmit starting time (T1min)		
	FR	Temps de réaction à l'émission AT (T1min)		
	ES	Tiempo de reaccion de emision AT (T1min)		
	IT	Tempo di Partenza Trasmissione mini. AT (T1min)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		400	**Cyc. transmittable:**	no

S-0-0004, Transmit/receive transition time (TATMT)

This parameter indicates the time required for the slave to switch to reception of the master data telegram after sending the drive telegram.

The transmission/reception transition time is read in communications phase 2 by the master to calculate the time to send the master data telegram T2 **S-0-0089, MDT Transmit starting time (T2)**.

See also the functional description: "Configuration of the telegram send and receive times".

S-0-0004 - Attributes

Para. Name:	**DE**	Umschaltzeit Senden-Empfangen (TATMT)		
	EN	Transmit/receive transition time (TATMT)		
	FR	Temps de transition entre transmission et réception (TATMT)		
	ES	Tiempo de conmutacion emision-recepcion (TATMT)		
	IT	Tempo di Transizione Trasmis./Ricez. (TATMT)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0005, Minimum feedback acquisition time(T4min)

This is the minimum time requirement between feedback-value acquisition and the end of the master synchronization telegram. This value is indicated by the drive in such a manner that the current feedback values can be transmitted to the NC in the next drive telegram.

The master reads this value in communications phase 2 to set the acquisition starting time of the feedback values T4 **S-0-0007, Feedback acquisition starting time (T4)** for all drives.

See also the functional description: "Configuration of the telegram send and receive times".

S-0-0005 - Attributes

Para. Name:	**DE**	Mindestzeit Istwerterfassung(T4min)		
	EN	Minimum feedback acquisition time(T4min)		
	FR	Temps mini. d'acquisition des données retour (T4min)		
	ES	Tiempo minimo registro de valor real(T4min)		
	IT	Tempo di Acquisizione Feedback Minimo (T4min)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0006, AT Transmission starting time (T1)

The transmission starting time determines when the slave must send its drive telegram in communications phases 3 and 4, after the end of the master synchronization telegram.

This parameter is transmitted from the master to the slave in communications phase 2 and is active from communications phase 3 on.

The transmission time drive telegram must be set equal to or greater than the transmission reaction time **S-0-0003, Minimum AT transmit starting time (T1min)**.

The following must apply:

$$T1min \leq T1$$

See also the functional description: "Configuration of the telegram send and receive times"

S-0-0006 - Attributes

Para. Name:	**DE**	Sendezeitpunkt Antriebs-Telegramm (T1)		
	EN	AT Transmission starting time (T1)		
	FR	Temps de départ de transmission de l'AT (T1)		
	ES	Punto temporal de emision telegrama de accionamiento (T1)		
	IT	Tempo di Partenza Trasmissione AT (T1)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		12 / 65000		
Default value:		400	**Cyc. transmittable:**	no

S-0-0007, Feedback acquisition starting time (T4)

This is the feedback acquisition starting time set by the master after the end of the master synchronization telegram. Thus, the master can set the same feedback acquisition starting time for all drives that work together. This guarantees synchronized feedback-value acquisition among the affected drives. Also, the cyclically transferred command values are processed at time T4.

The master must set the feedback acquisition starting time equal to or less than the difference between the **S-0-0002, SERCOS Cycle time (Tscyc)** and the polled **S-0-0005, Minimum feedback acquisition time (T4min)**.

The following must apply:

$$T4 \leq T_{Scyc} - T4min$$

See also the functional description: "Configuration of the telegram send and receive times"

S-0-0007 - Attributes

Para. Name:	**DE**	Messzeitpunkt Istwerte (T4)		
	EN	Feedback acquisition starting time (T4)		
	FR	Temps de départ d'acquisition des données retour (T4)		
	ES	Punto temporal de medicion valores reales (T4)		
	IT	Tempo di Part. Acquisizione Feedback (T4)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		11 / 65000		
Default value:		1000	**Cyc. transmittable:**	no

S-0-0008, Command valid time (T3)

The "command valid time" indicates the time after which the drive may access new command values.

Thus, the master can set the same "command valid time" for all drives that work together. The drive activates the "command valid time" beginning with communications phase 3.

See also the functional description: "Configuration of the telegram send and receive times"

S-0-0008 - Attributes

Para. Name:	**DE**	Zeitpunkt für Sollwert gültig (T3)		
	EN	Command valid time (T3)		
	FR	Temps pour consigne valide (T3)		
	ES	Punto temporal para valor nominal valido (T3)		
	IT	Tempo di Comando Valido (T3)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65000		
Default value:		1900	**Cyc. transmittable:**	no

S-0-0009, Beginning address in master data telegram

This parameter displays the start address of a drive's data record in the Master Data Telegram, expressed as a byte position. It begins with 1 for the first data byte after the address field in the MDT.

The start address of the drive's data record in the MDT is transmitted to each drive by the master in communications phase 2. The address is activated beginning with communications phase 3.

See also the functional description: "Configuration of the telegram send and receive times"

S-0-0009 - Attributes

Para. Name:	**DE**	Anfangsadresse im Master-Daten-Telegramm		
	EN	Beginning address in master data telegram		
	FR	Adresse de départ dans le MDT		
	ES	Direccion inicial en telegrama de datos maestro		
	IT	Indirizzo iniziale del Telegramma Dati Master		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 65531		
Default value:		1	**Cyc. transmittable:**	no

S-0-0010, Length of master data telegram

The length in bytes of the Master Data Telegram contains the data records of all the drives. The MDT length is transmitted by the master to all drives in communications phase 2. It is activated by the master and slave beginning with communications phase 3.

See also the functional description: "Configuration of the telegram send and receive times"

S-0-0010 - Attributes

Para. Name:	**DE**	Länge Master-Daten-Telegramm		
	EN	Length of master data telegram		
	FR	Longueur du MDT		
	ES	Longitud telegrama de datos maestro		
	IT	Lunghezza del Telegramma Dati Master		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		4 / 65534		
Default value:		4	**Cyc. transmittable:**	no

S-0-0011, Class 1 diagnostics

Function: Drive lock.

A Class 1 diagnostic error situation discovered by the drive leads to:

1. The drive's error response, as described in the functional description under "Error".
2. Setting the static error bits to 1 for Class 1 diagnostic in the drive status. The error bit will not be set back to 0 by the drive until no Class 1 diagnostic error remains and command **S-0-0099, C500 Reset class 1 diagnostic** has been received by the drive via the service channel.

Parameter structure:

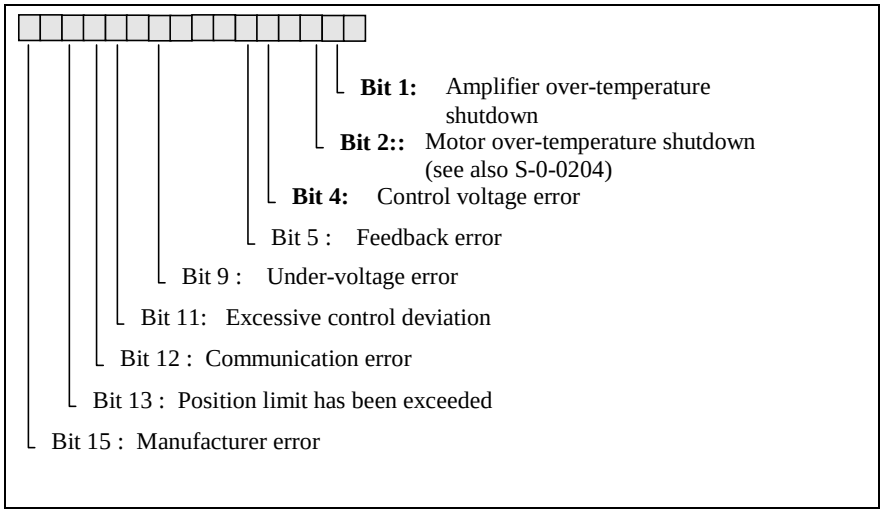
Bit 1: Amplifier over-temperature shutdown
Bit 2:: Motor over-temperature shutdown (see also S-0-0204)
Bit 4: Control voltage error
Bit 5 : Feedback error
Bit 9 : Under-voltage error
Bit 11: Excessive control deviation
Bit 12 : Communication error
Bit 13 : Position limit has been exceeded
Bit 15 : Manufacturer error

Fig. 2-1: S-0-0011, Class 1 diagnostics

Note: Only the bits indicated here are supported by the software.

See also the functional description: "S-0-0011, Class 1 diagnostics".

S-0-0011 - Attributes

Para. Name:	**DE**	Zustandsklasse 1		
	EN	Class 1 diagnostics		
	FR	Diagnostic de classe 1 (C1D)		
	ES	Diagnosticos clase 1		
	IT	Diagnostica Classe 1		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0012, Class 2 diagnostics

Function: Shutdown warning.

When a warning appears or disappears in Class 2 diagnostics, the change bit in the drive status word will be set to 1. When Class 2 diagnostics are read over the service channel, the change bit is reset to 0.

Parameter structure:

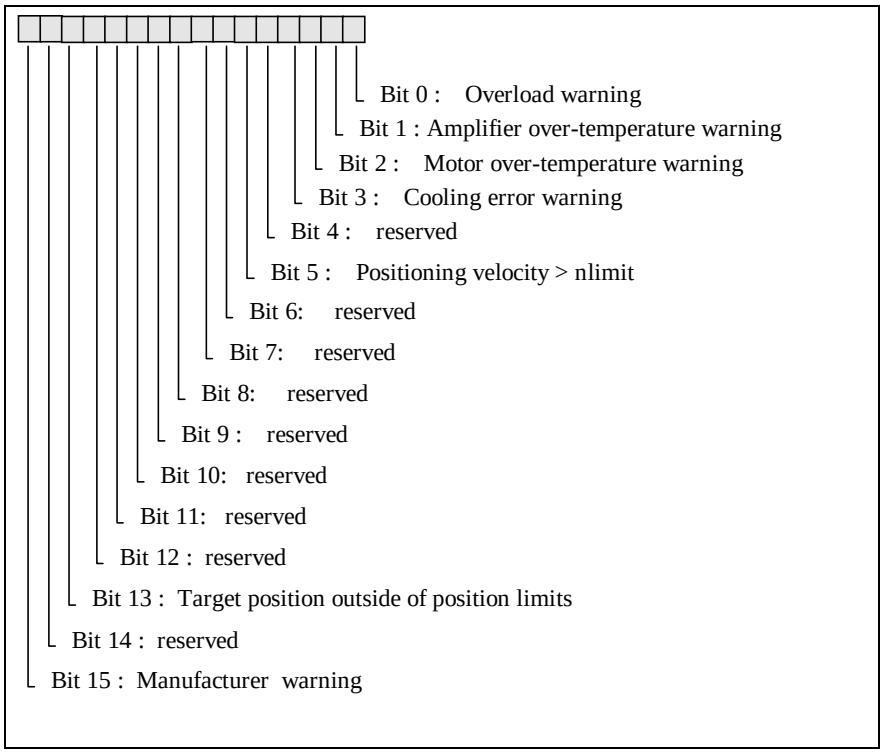
Bit 0 : Overload warning
Bit 1 : Amplifier over-temperature warning
Bit 2 : Motor over-temperature warning
Bit 3 : Cooling error warning
Bit 4 : reserved
Bit 5 : Positioning velocity > nlimit
Bit 6: reserved
Bit 7: reserved
Bit 8: reserved
Bit 9 : reserved
Bit 10: reserved
Bit 11: reserved
Bit 12 : reserved
Bit 13 : Target position outside of position limits
Bit 14 : reserved
Bit 15 : Manufacturer warning

Fig. 2-2: S-0-0012, Class 2 diagnostics

Note: Only the bits indicated here are supported by the software.

See also the functional description: "S-0-0012, Class 2 diagnostics".

S-0-0012 - Attributes

Para. Name:	**DE**	Zustandsklasse 2		
	EN	Class 2 diagnostics		
	FR	Diagnostic de classe 2 (C2D)		
	ES	Diagnosticos clase 2		
	IT	Diagnostica Classe 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0013, Class 3 diagnostics

Function: **Operating status messages**.

When a message appears or disappears in Class 3 diagnostics, the change bit for Class 3 diagnostic in the drive status word will be set to 1. When Class 3 diagnostics are read via the service channel, the change bit is reset to 0.

Parameter structure:

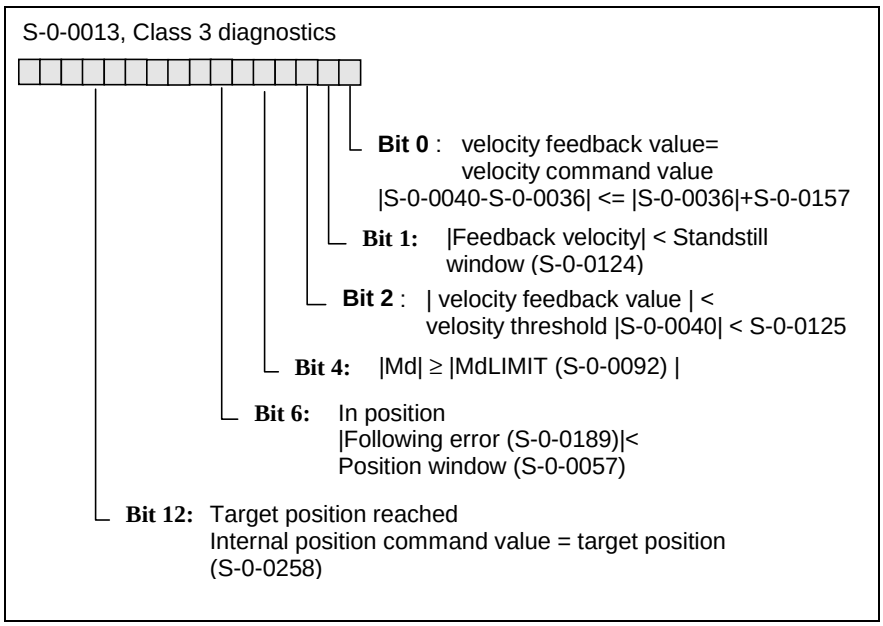
S-0-0013, Class 3 diagnostics
Bit 0 : velocity feedback value= velocity command value |S-0-0040-S-0-0036| <= |S-0-0036|+S-0-0157
Bit 1: |Feedback velocity| < Standstill window (S-0-0124)
Bit 2 : | velocity feedback value | < velosity threshold |S-0-0040| < S-0-0125
Bit 4: |Md| ≥ |MdLIMIT (S-0-0092) |
Bit 6: In position |Following error (S-0-0189)|< Position window (S-0-0057)
Bit 12: Target position reached Internal position command value = target position (S-0-0258)

Fig. 2-3: S-0-0013, Class 3 Diagnostics

Note: Only the bits indicated here are supported by the software.

See also the functional description: "S-0-0013, Class 3 diagnostics".

S-0-0013 - Attributes

Para. Name:	**DE**	Zustandsklasse 3		
	EN	Class 3 diagnostics		
	FR	Diagnostic de classe 3 (C3D)		
	ES	Diagnosticos clase 3		
	IT	Diagnostica Classe 3		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0014, Interface status

This parameter indicates in the bits 3-15 whether a communication error occurred.

Note that: All bits 3 .. 15 = 0 ⇒ no error

One bit in 3 .. 15 = 1 ⇒ error pending

If a communications error occurs, then bit 12 will be set in the Class 1 diagnostic parameter (**S-0-0011**). The drive will not reset the communication error to 0 until no interface error remains and command **S-0-0099, C500 Reset class 1 diagnostic** has been received via the service channel.

The current communications phase can be examined through the first three bits (0, 1, 2).

Parameter structure:

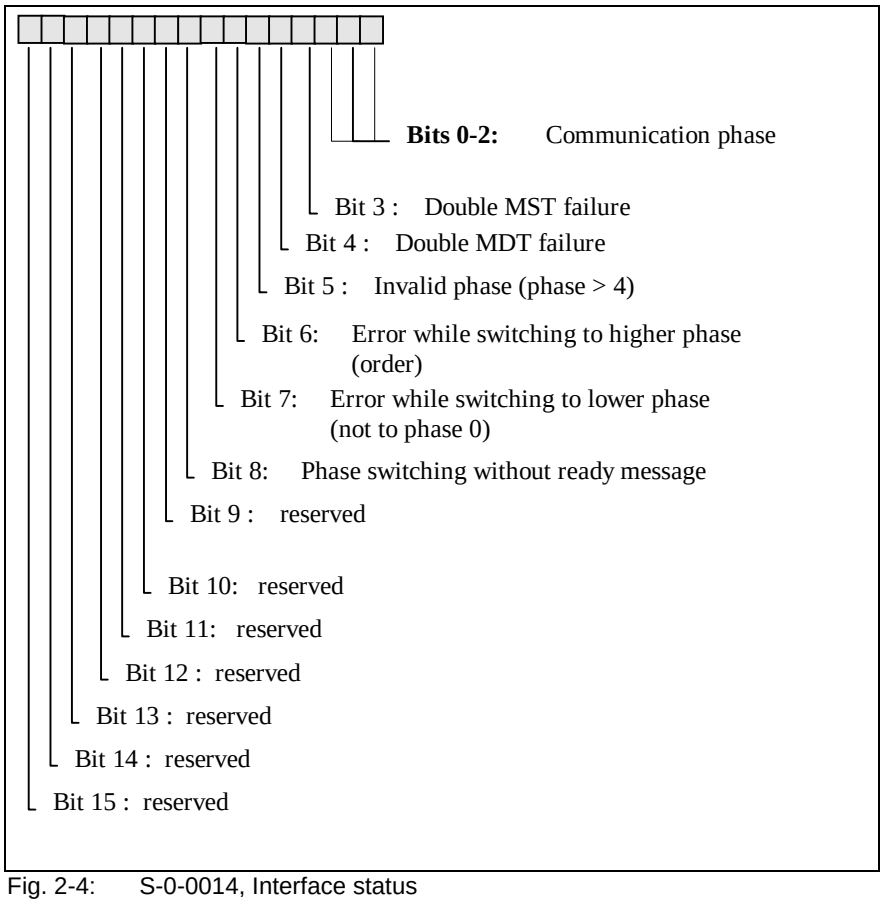
Bits 0-2: Communication phase
Bit 3 : Double MST failure
Bit 4 : Double MDT failure
Bit 5 : Invalid phase (phase > 4)
Bit 6: Error while switching to higher phase (order)
Bit 7: Error while switching to lower phase (not to phase 0)
Bit 8: Phase switching without ready message
Bit 9 : reserved
Bit 10: reserved
Bit 11: reserved
Bit 12 : reserved
Bit 13 : reserved
Bit 14 : reserved
Bit 15 : reserved

Fig. 2-4: S-0-0014, Interface status

See also the functional description: "Diagnostic of the interface Status"

S-0-0014 - Attributes

Para. Name:	**DE**	Schnittstellen-Status		
	EN	Interface status		
	FR	Etat d'interface		
	ES	Estado de interfaces		
	IT	Stato Interfaccia		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0015, Telegram type parameter

In this parameter, you can choose between priority telegrams and the configured telegram.

The telegram type that is selected will be activated in the master and slave only from communications phase 3 on.

Parameter structure:

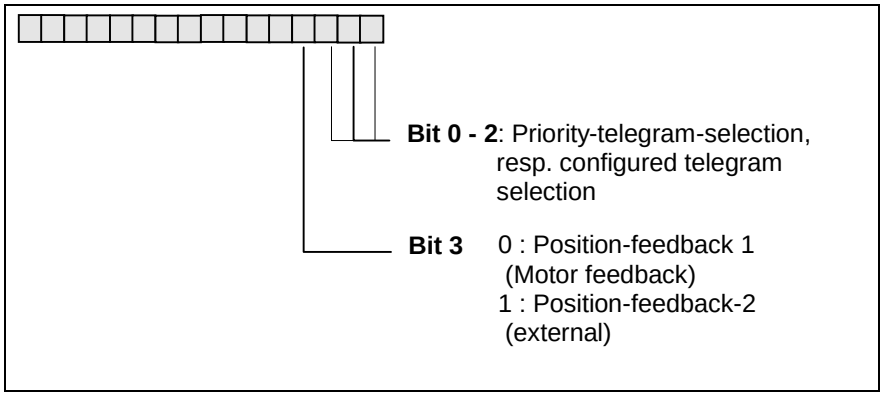
Bit 0 - 2: Priority-telegram-selection, resp. configured telegram selection
Bit 3
0 : Position-feedback 1 (Motor feedback)
1 : Position-feedback-2 (external)

Fig. 2-5: S-0-0015, Telegram type parameter

Note: Only the bits indicated here are supported by the software.

Telegrams:

Bit 0-2:		MDT:	AT:
0	PT 0	No cyclical data	No cyclical data
1	PT 1	**DF1**: S-0-0080 Torque command	No cyclical data
2	PT 2	**DF1**: S-0-0036, Velocity command value	**DF1**: S-0-0040 Velocity feedback value
3	PT 3	**DF1**: S-0-0036, Velocity command value	**DF1**: S-0-0051/S-0-0053 Position feedback value 1
4	PT 4	**DF1**: S-0-0047, Position command value	**DF1**: S-0-0051/S-0-0053 Position feedback value 1
5	PT 5	**DF1**: S-0-0047, Position command value **DF2**: S-0-0036, Velocity command value	**DF1**: S-0-0051/S-0-0053 Position feedback value 1 **DF2**: S-0-0040 Velocity feedback value
6	PT 6	**DF1**: S-0-0036, Velocity command value	No cyclical data
7	Configurable telegram		

Fig. 2-6: Supported bits

where PT : Priority telegram
DF1/2: Data field 1/2

See also the functional description: "Configuration of telegram contents"

S-0-0015 - Attributes

Para. Name:	**DE**	Telegrammarten-Parameter		
	EN	Telegram type parameter		
	FR	Paramètre de type de télégramme		
	ES	Parametros de tipo de telegrama		
	IT	Parametri Tipo Telegramma		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase2
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 15		
Default value:		0	**Cyc. transmittable:**	no

S-0-0016, Custom amplifier telegram configuration list

If a configured telegram is set in **S-0-0015, Telegram type parameter**, then this list will be used for application-specific configuration of the data record in the AT.

The list can contain only operating data that are listed in the parameter **S-0-0187, List of configurable data in the AT**.

See also the functional description: "Configuration of telegram contents"

S-0-0016 - Attributes

Para. Name:	**DE**	Konfig.-Liste Antriebs-Telegramm		
	EN	Custom amplifier telegram configuration list		
	FR	Liste de configuration d'AT		
	ES	Telegrama de accionamiento lista de conf.		
	IT	Configurazione personalizzata Telegramma		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte variabel	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	Phase2
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0017, IDN-list of all operation data

The ID numbers for all parameters with operation data available in the drive are accessible in this IDN list.

See also the functional description: "Parameter"

S-0-0017 - Attributes

Para. Name:	**DE**	IDN-Liste aller Betriebsdaten		
	EN	IDN-list of all operation data		
	FR	Liste des IDN de toutes les données d'exploitation		
	ES	Lista IDN de todos los tipos de servicio		
	IT	IDN Lista di tutti i Dati operativi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0018, IDN-list of operation data for CP2

The data of the IDN-list contains the ident-numbers of all parameters that the drive checks in the transition command for phase 3. Only when the data of the listed ident-numbers are correct, the transition command can be acquitted positive, and the transition to communications phase 3 can be allowed.

S-0-0018 - Attributes

Para. Name:	**DE**	IDN-Liste Betriebsdaten Kommunikationsphase 2		
	EN	IDN-list of operation data for CP2		
	FR	Liste IDN des données d'exploitation relatives à CP2		
	ES	Lista IDN datos de servicio fase de comunicación 2		
	IT	IDN Lista di tutti i Dati per fase di comm. 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	constant
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0019, IDN-list of operation data for CP3

The data of the IDN-list contains the ident-numbers of all parameters that the drive checks in the transition command for phase 4. Only when the data of the listed ident-numbers are correct, the transition command can be acquitted positive, and the transition to communications phase 4 can be allowed.

S-0-0019 - Attributes

Para. Name:	**DE**	IDN-Liste Betriebsdaten Kommunikationsphase 3		
	EN	IDN-list of operation data for CP3		
	FR	Liste IDN des données d'exploitation relatives à CP3		
	ES	Lista IDN datos de servicio fase de comunicación 3		
	IT	IDN Lista di tutti i Dati per fase di comm. 3		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	constant
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0021, IDN-list of invalid op. data for comm. Ph. 2

The drive checks whether all communications parameters are complete and correct before executing a delayed phase switch from 2 to **S-0-0127, C100 Communication phase 3 transition check** with the control system-driven transition check command.

If the drive identifies one or more IDNs as invalid, it will write the operating data that is still needed or is invalid to this ID No. list. This will be displayed to the drive by command error diagnostic message **C101 Invalid communication parameter (S-0-0021)**.

See also the functional description: "S-0-0127, C1 Communication Phase 3 Transition Check".

S-0-0021 - Attributes

Para. Name:	**DE**	IDN-Liste ungültige Betriebsdaten Phase 2		
	EN	IDN-list of invalid op. data for comm. Ph. 2		
	FR	Liste des IDN-données d'exploitation invalides phase 2		
	ES	Lista IDN de datos de servicio no validos fase 2		
	IT	IDN Lista dei Dati oper. invalidi per Comm. in Fase 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0022, IDN-list of invalid op. data for comm. Ph. 3

Before the drive executes a delayed phase switch from 3 to **S-0-0128, C200 Communication phase 4 transition check** with the control system-driven transition check command, the drive will check parameters for the following conditions:

- Validity of the parameter
- The parameter value is found within the valid input range.
- Compatibility with other parameters.

If the result of a parameter check is negative, this operating data will be entered in the ID No. (IDN) list.

The drive then responds to the transition command with the communications error diagnostic messages

- **C201 Invalid Parameter(s) (->S-0-0022) or**
- **C202 Parameter limit error (->S-0-0022) or**
- **C203 Parameter calculation error (->S-0-0022)**

See also the functional description: "S-0-0128, C2 Communication Phase 4 Transition Check".

S-0-0022 - Attributes

Para. Name:	**DE**	IDN-Liste ungültige Betriebsdaten Phase 3		
	EN	IDN-list of invalid op. data for comm. Ph. 3		
	FR	IDN-Liste données d'exploitation invalides phase 3		
	ES	Lista IDN de datos de servicio no validos fase 3		
	IT	IDN Lista dei Dati oper. invalidi per Comm. in Fase 3		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0024, Config. list of the master data telegram

If the configured telegram is set in **S-0-0015, Telegram type parameter**, then the configurable data record in the MDT will be configured application-specifically using this list.

The list can contain only operating data that are listed in the parameter **S-0-0188, List of configurable data in the MDT**.

See also the functional description: "Configuration of telegram contents"

S-0-0024 - Attributes

Para. Name:	**DE**	Konfig.-Liste Master-Daten-Telegramm		
	EN	Config. list of the master data telegram		
	FR	Liste de configuration du MDT		
	ES	Configuracion lista de telegramas de datos maestros		
	IT	Lista Config. del Telegramma Dati Master		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte variabel	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	Phase2
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0025, IDN-list of all procedure commands

The data of the IDN-list contains the ident-numbers of all commands in the drive controller.

See also the functional description: "Commands"

S-0-0025 - Attributes

Para. Name:	**DE**	IDN-Liste aller Kommandos		
	EN	IDN-list of all procedure commands		
	FR	Liste des IDN de toutes les commandes		
	ES	Lista IDN de todos los comandos		
	IT	IDN Lista di tutti i Comandi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	constant
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		---	**Cyc. transmittable:**	no

S-0-0026, Configuration list signal status word

The data of the parameters stores the ident-numbers of the signals or bits which the signal status word (S-0-0144) contains.

The order of the ident-numbers in the configuration list determines the bit enumeration, beginning with the LSB in the signal status word.

That means, the first ident-number in S-0-0026 defines the bit 0, the second ident-number in S-0-0026 defines bit 1 in the parameter S-0-0144, Signal status word, and so on.

See also the functional description: "Configurable signal status word"

S-0-0026 - Attributes

Para. Name:	**DE**	Konfigurations-Liste Signal-Statuswort		
	EN	Configuration list signal status word		
	FR	Liste de configuration pour mot d'état de signal		
	ES	Lista de configuración estado de señal		
	IT	Lista di Configurazione della Parole di Stato Segnali		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte variabel	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	Phase 3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

S-0-0028, MST error counter

The MST error count counts all invalid Master Synchronization Telegrams in communications phases 3 and 4.

If two MSTs fail in direct succession, then error **F401 Double MST error shutdown** will be generated and the operation will return to phase 0.

The MST error count has a limit stop at (2^16) - 1. This means that during a highly distorted transfer the MST Error count will show the value 65535 after a long time.

See also the functional description: "Error count for telegram interrupts".

S-0-0028 - Attributes

Para. Name:	**DE**	Fehlerzähler MST		
	EN	MST error counter		
	FR	Compteur de MST erronés		
	ES	Contador de errores MST		
	IT	Contatore errori MST		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_0V	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0029, MDT error counter

This parameter counts all invalid Master Data Telegrams in communications phases 3 and 4.

If two MDTs fail in direct succession, then error **F401 Double MST error shutdown** will be generated, and the operation will return to phase 0.

The MDT error counter has a limit stop at (2^16) - 1. This means that during a highly distorted transfer the MDT error count will show a value of 65535 after a long time.

See also the functional description: "Error count for telegram interrupts".

S-0-0029 - Attributes

Para. Name:	**DE**	Fehlerzähler MDT		
	EN	MDT error counter		
	FR	Compteur de MDT erronés		
	ES	Contador de errores MDT		
	IT	Contatore errori MDT		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0030, Manufacturer version

The **version of the drive firmware** can be read from this parameter as plain text. The **structure** of the manufacturer version is defined as follows:

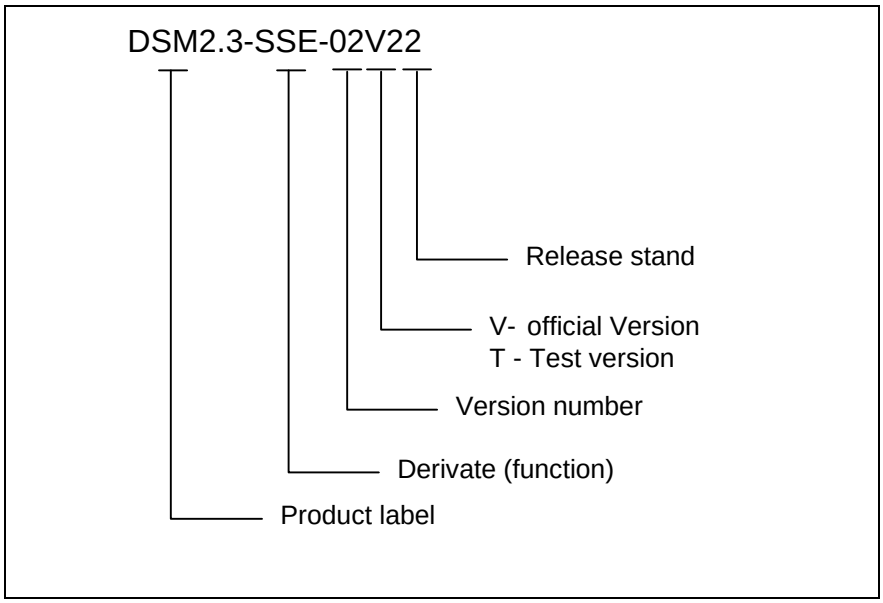

Fig. 2-7: Manufacturer Version

Examples:

DSM2.3-SSE-01V02

DKC01.1-ASE-04V01

See also the functional description: "Firmware Overview".

S-0-0030 - Attributes

Para. Name:	**DE**	Hersteller-Version		
	EN	Manufacturer version		
	FR	Version du fabriquant		
	ES	Version de fabricante		
	IT	Versione Costruttore		
Function:		Parameter	**Editability:**	no
Data length:		1Byte variabel	**Memory:**	no
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0032, Primary mode of operation

The mode of operation defined in this parameter will be activated in the drive when

- The **primary mode** of operation is **selected** in the master control word (bits 8 and 9 = 00).
- The control and power sections are **ready for operation**.
- The drive enable signal is set.

The operating mode can be selected by entering a bit list. Specific positions are defined in the bit list.

In **bit 3**, you can choose between working with position control without following (lag) error or with following error.

The following applies for bit 3:

Bit 3 = 0 position control with following error

Bit 3 = 1 position control without following error

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-controlled interpolation, encoder 1
0000,0000,0001,x100	Drive-controlled interpolation, encoder 2
0000,0010,0001,x011	Relative drive-controlled Interpolation, encoder 1
0000,0010,0001,x100	Relative drive-controlled Interpolation, encoder 2

Fig. 2-8: Bit list S-0-0032

See also the functional description: "Setting the Operating Mode Parameters"

S-0-0032 - Attributes

Para. Name:	**DE**	Hauptbetriebsart		
	EN	Primary mode of operation		
	FR	Mode de fonctionnement primaire		
	ES	Tipo de servicio principal		
	IT	Modo operativo primario		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0010b	**Cyc. transmittable:**	no

S-0-0033, Secondary operation mode 1

The mode of operation defined in this parameter will be activated in the drive if:

- The primary mode of operation is selected in the master control word (bits 8 and 9 = "01")
- The control and power sections are ready for operation.
- The drive enable signal is set.

The operating mode can be selected by entering a bit list. Specific positions are defined in the bit list.

In **bit 3**, you can choose between working with position control without following (lag) error or with following error.

The following applies:

Bit 3 = 0 position control with following error

Bit 3 = 1 position control without following error

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-controlled interpolation, encoder 1
0000,0000,0001,x100	Drive-controlled interpolation, encoder 2
0000,0010,0001,x011	Relative drive-controlled Interpolation, encoder 1
0000,0010,0001,x100	Relative drive-controlled Interpolation, encoder 2

Fig. 2-9: Bit list S-0-0033

See also the functional description: "Setting the Operating Mode Parameters"

S-0-0033 - Attributes

Para. Name:	**DE**	Nebenbetriebsart 1		
	EN	Secondary operation mode 1		
	FR	Mode de fonctionnement secondaire 1		
	ES	Tipo de servicio secundario 1		
	IT	Modo operativo secondario 1		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0010b	**Cyc. transmittable:**	no

S-0-0034, Secondary operation mode 2

The mode of operation defined in this parameter will be activated in the drive if:

- The main operating mode is selected in the master control word (bits 8 and 9 = "10")
- The control and power sections are ready for operation.
- The drive enable signal is set.

The operating mode can be selected by entering a bit list. Specific positions are defined in the bit list.

In **bit 3**, you can choose between working with position control without following (lag) error or with following error.

The following applies:

Bit 3 = 0 position control with following error

Bit 3 = 1 position control without following error

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-controlled interpolation, encoder 1
0000,0000,0001,x100	Drive-controlled interpolation, encoder 2
0000,0010,0001,x011	Relative drive-controlled Interpolation, encoder 1
0000,0010,0001,x100	Relative drive-controlled Interpolation, encoder 2

Fig. 2-10: Bit list S-0-0034

See also the functional description: "Setting the Operating Mode Parameters"

S-0-0034 - Attributes

Para. Name:	**DE**	Nebenbetriebsart 2		
	EN	Secondary operation mode 2		
	FR	Mode de fonctionnement secondaire 2		
	ES	Tipo de servicio secundario 2		
	IT	Modo operativo secondario 2		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0010b	**Cyc. transmittable:**	no

S-0-0035, Secondary operation mode 3

The mode of operation defined in this parameter will be activated in the drive if:

- The primary mode of operation is selected in the master control word (bits 8 and 9 = "11")
- The control and power sections are ready for operation.
- The drive enable signal is set.

The operating mode can be selected by entering a bit list. Specific positions are defined in the bit list.

In **bit 3**, you can choose between working with position control without following (lag) error or with following error.

The following applies:

Bit 3 = 0 position control with following error

Bit 3 = 1 position control without following error

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-controlled interpolation, encoder 1
0000,0000,0001,x100	Drive-controlled interpolation, encoder 2
0000,0010,0001,x011	Relative drive-controlled Interpolation, encoder 1
0000,0010,0001,x100	Relative drive-controlled Interpolation, encoder 2

Fig. 2-11: Bit list S-0-0035

See also the functional description: "Setting the Operating Mode Parameters"

S-0-0035 - Attributes

Para. Name:	**DE**	Nebenbetriebsart 3		
	EN	Secondary operation mode 3		
	FR	Mode de fonctionnement secondaire 3		
	ES	Tipo de servicio secundario 3		
	IT	Modo operativo secondario 2		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0010b	**Cyc. transmittable:**	no

S-0-0036, Velocity command value

This parameter is used to set the velocity command value. This together with **S-0-0037, Additive velocity command value** determines the effective Velocity Command Value for the drive.

In the position control operating modes, this parameter displays the output error signal of the position controller.

See also the functional description: "Velocity control".

S-0-0036 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Sollwert		
	EN	Velocity command value		
	FR	Valeur de commande de vitesse		
	ES	Valor nominal de velocidad		
	IT	Valore di Velocità comandato		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		S-0-0044 / S-0-0044		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0037, Additive velocity command value

The additional velocity command value is added to the **S-0-0036, Velocity command value** in the drive.

See also the functional description: "Velocity control".

S-0-0037 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Sollwert additiv		
	EN	Additive velocity command value		
	FR	Valeur de commande de vitesse supplémentaire		
	ES	Valor nominal adicional de velocidad		
	IT	Comando di Velocità addizzionale		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		S-0-0044 / S-0-0044		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0040, Velocity feedback value

The velocity feedback value can be transferred from the drive control device to the control system either cyclically or via the service channel.

See also the functional description: "Preparations for Setting the Velocity Controller".

S-0-0040 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Istwert		
	EN	Velocity feedback value		
	FR	Valeur de retour de vitesse		
	ES	Valor real de velocidad		
	IT	Feedback di Velocità		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0044	**Extrem value check:**	no
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0041, Homing velocity

The product of **S-0-0041, Homing velocity** and the **S-0-0108, Feedrate override** forms the velocity at which the drive executes the command **S-0-0148, C600 Drive controlled homing procedure command**.

See also the functional description: "Drive-controlled homing".

S-0-0041 - Attributes

Para. Name:	**DE**	Referenzfahr-Geschwindigkeit		
	EN	Homing velocity		
	FR	Vitesse de prise d'origine		
	ES	Velocidad de puesta a cero		
	IT	Velocità per Azzeramento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0044		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0042, Homing acceleration

This parameter indicates the acceleration value at which the drive executes the command **S-0-0148, C600 Drive controlled homing procedure command**.

See also the functional description: "Drive-controlled homing".

S-0-0042 - Attributes

Para. Name:	**DE**	Referenzfahr-Beschleunigung		
	EN	Homing acceleration		
	FR	Accélération de prise d'origine		
	ES	Aceleracion de puesta a cero		
	IT	Accellerazione per Azzeramento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / S-0-0160		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0043, Velocity polarity parameter

This parameter is used to switch the polarity of the velocity data in relation to the application.

Polarities are switched externally, at the input and output of a control system rather than inside the system.

The following applies to rotary motors:

Clockwise rotation when facing the motor shaft is the rule for a positive velocity command value and a positive polarity.

The following applies to linear motors:

The positive direction is used when the primary is moving toward the linear motor power cable side.

Parameter structure:

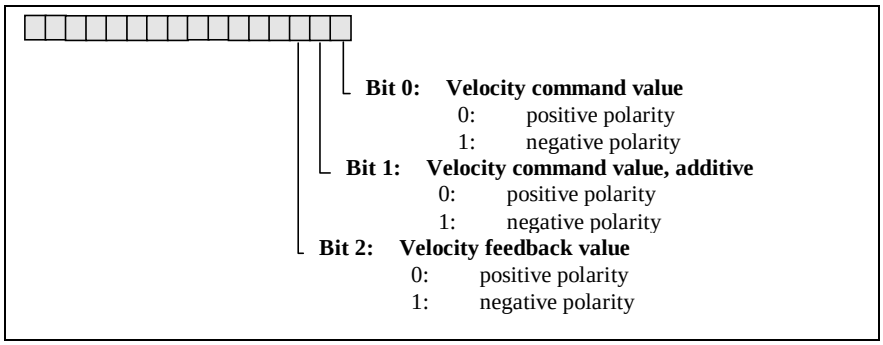

Fig. 2-12: S-0-0043, Velocity polarity parameter

Note: The bits 1 and 2 are copies of bit 0. Only changes of bit 0 have an effect. Different settings of the single bits are not possible!

See also the functional description: "Command polarities and actual value polarities".

S-0-0043 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Polaritäten-Parameter		
	EN	Velocity polarity parameter		
	FR	Paramètre de polarité de vitesse		
	ES	Parametros de polaridad de velocidad		
	IT	Parametro Direzione Velocità		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 7		
Default value:		0	**Cyc. transmittable:**	no

S-0-0044, Velocity data scaling type

Various scaling types can be defined for the velocity data in the drive.

Parameter structure:

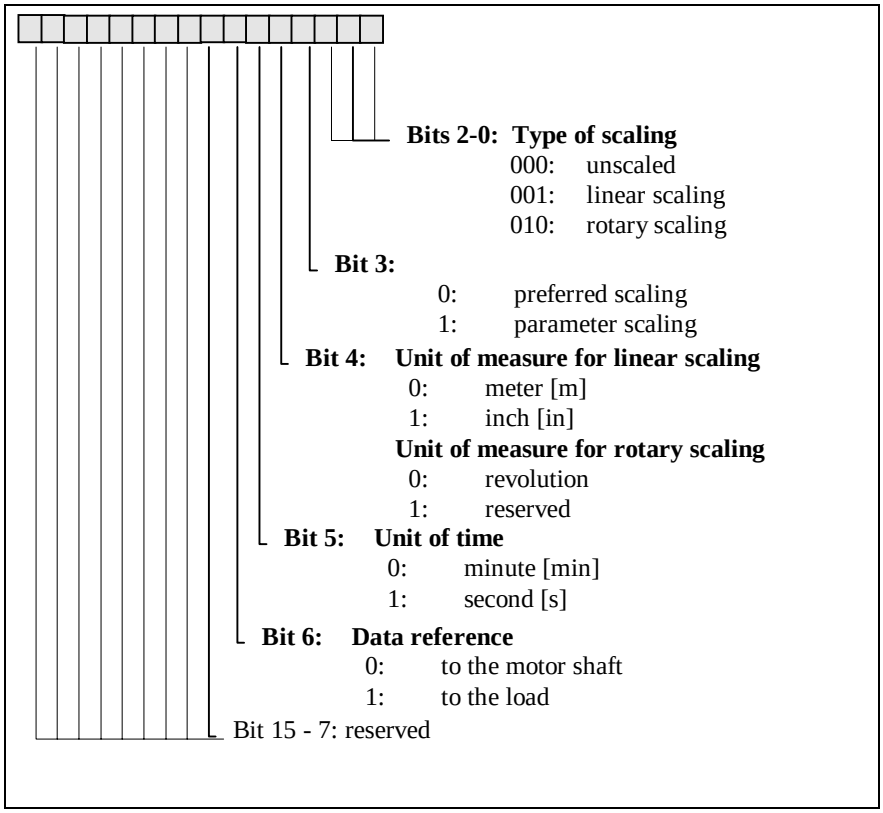

Fig. 2-13: S-0-0044, Velocity data scaling type

See also the functional description: "Velocity data display format".

S-0-0044 - Attributes

Para. Name:	**DE**	Wichtungsart für Geschwindigkeitsdaten		
	EN	Velocity data scaling type		
	FR	Type de calibrage pour données de vitesse		
	ES	Tipo de escala de datos de velocidad		
	IT	Tipo di Scala per Dati di Velocità		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0100 0010b	**Cyc. transmittable:**	no

S-0-0045, Velocity data scaling factor

This parameter defines the scaling factor for all velocity data in the drive.

If preferred scaling is set with **S-0-0044, Velocity data scaling type**, this parameter will be set to 1.

See also the functional description: "Velocity data display format"

S-0-0045 - Attributes

Para. Name:	**DE**	Wichtungs-Faktor für Geschwindigkeitsdaten		
	EN	Velocity data scaling factor		
	FR	Facteur de calibrage pour données de vitesse		
	ES	Factor de escala para datos de velocidad		
	IT	Fattore di Scala per Dati Velocità		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 65535		
Default value:		1	**Cyc. transmittable:**	no

S-0-0046, Velocity data scaling exponent

This parameter defines the scaling exponent for all velocity data in the drive.

See also the functional description: "Velocity data display format".

S-0-0046 - Attributes

Para. Name:	**DE**	Wichtungs-Exponent für Geschwindigkeitsdaten		
	EN	Velocity data scaling exponent		
	FR	Exposant de calibrage pour données de vitesse		
	ES	Exponente de escala para datos de velocidad		
	IT	Esponente per Dati Velocità		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-32 / 32		
Default value:		-4	**Cyc. transmittable:**	no

S-0-0047, Position command value

In position control operating mode, this parameter is transferred from the control system to the drive every NC cycle time.

See also the functional description: "Generator Feature: Position Command Value Interpolator"

S-0-0047 - Attributes

Para. Name:	**DE**	Lage-Sollwert		
	EN	Position command value		
	FR	Valeur de commande de position		
	ES	Valor nominal de posicion		
	IT	Valore di Posizione Comandato		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0049, Positive position limit value

The "positive position limit value" describes the maximum extent of travel in the positive direction.

The position limit value is active only when all position data refers to the homing point (bit 0 is set to 1 in parameter **S-0-0403, Position feedback value status**). The position limit values can be switched off using bit 4 in **S-0-0055, Position polarity parameter**.

If a **Target position, S-0-0258** beyond the positive position limit value is set for the drive, then the drive sets warning bit 13 in **S-0-0012, Class 2 diagnostic** and also generates warning **E253 Target position out of travel zone**.

If the positive position limit value is exceeded, the drive sets error bit 13 in **S-0-0011, Class 1 diagnostic**.

See also the functional description: "Axis limit values".

S-0-0049 - Attributes

Para. Name:	**DE**	Lage-Grenzwert positiv		
	EN	Positive position limit value		
	FR	Limite de position positive		
	ES	Valor limite de posicion positivo		
	IT	Limite positivo di Posizione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		1000000	**Cyc. transmittable:**	no

S-0-0050, Negative position limit value

The "negative position limit value" describes the maximum extent of travel in the negative direction.

The position limit value is active only when all position data refers to the homing point (bit 0 is set to 1 in parameter **S-0-0403, Position feedback value status**). The position limit values can be switched off using bit 4 in **S-0-0055, Position polarity parameter**.

If a target position beyond the negative position limit value is set for the drive, then the drive sets warning bit 13 in **S-0-0012, Class 2 diagnostic** and also generates warning **E253 Target position out of travel zone**.

If the negative position limit value is exceeded, the drive will set error bit 13 in **S-0-0011, Class 1 diagnostics**.

See also the functional description: "Axis limit values".

S-0-0050 - Attributes

Para. Name:	**DE**	Lage-Grenzwert negativ		
	EN	Negative position limit value		
	FR	Limite de position négative		
	ES	Valor limite de posicion negativo		
	IT	Limite negativo di Posizione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		-1000000	**Cyc. transmittable:**	no

S-0-0051, Position feedback value 1 (motor feedback)

Position feedback value 1 represents the current position of the motor encoder. The initialization of the position feedback happens during the execution of **S-0-0128, C200 Communication phase 4 transition check**; that means, the feedback positions are only initialized after successful execution of the command.

If an absolute encoder is present, the value in **S-0-0051, Position Feedback Value 1** then shows the absolute position referred to the machine's zero-point, provided that during the first setup the command **P-0-0012, C300 Command 'Set absolute measurement'** has been executed once.

In the other case, the initialization value depends on whether the parameter **P-0-0019, Position start value** has been written to during the phase progression or whether the motor feedback is an absolute encoder.

See also the functional description: "Setting the Measurement System".

S-0-0051 - Attributes

Para. Name:	**DE**	Lage-Istwert 1 (Motorgeber)		
	EN	Position feedback value 1 (motor feedback)		
	FR	Valeur de retour de position 1 (du moteur)		
	ES	Valor real de posicion 1		
	IT	Feedback di Posizione Valore 1 (al Motore)		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0052, Reference distance 1

The parameter displays the distance between the machine zero-point and the homing point for the motor measurement system (Position feedback value 1). The parameter is used for the execution of the commands
S-0-0148, C600 Drive controlled homing procedure command and **P-0-0012, C300 Command 'Set absolute measurement'**.

During the command **S-0-0148, C600 Drive controlled homing procedure command**, the distance between the homing point and the machine zero-point is written there. If homing is done with run to the homing point, the drive goes to the homing point, and **S-0-0051, Position feedback value 1** contains the value of **S-0-0052, Reference distance 1**.

For the command **P-0-0012, C300 Command 'Set absolute measurement'**, the desired value for **S-0-0051, Position feedback value 1** is written there. After successful execution of ‘Setting absolute measurement’, **S-0-0051, Position feedback value 1** shows the value of **S-0-0052, Reference distance 1**.

See also the functional description: "Drive-controlled homing".

S-0-0052 - Attributes

Para. Name:	**DE**	Referenzmaß Lage-Istwert 1		
	EN	Reference distance 1		
	FR	Distance de référence 1		
	ES	Medida de referencia valor de posicion 1		
	IT	Distanza di Riferimento 1		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0053, Position feedback value 2 (ext. feedback)

Position feedback value 1 represents the current position of the **optional external encoder**. The initialization of the position feedback happens during the execution of **S-0-0128, C200 Communication phase 4 transition check**; that means, the feedback positions are only initialized after successful execution of the command.

If an absolute optional encoder is present, the value in **S-0-0053, Position Feedback Value 2** then shows the absolute position referred to the machine's zero-point, provided that during the first setup the command **P-0-0012, C300 Command 'Set absolute measurement'** has been executed once.

In the other case, the initialization value depends on whether the parameter **P-0-0019, Position start value** has been written to during the phase progression or whether an existing optional feedback is an absolute encoder.

See also the functional description: "Setting the Measurement System".

S-0-0053 - Attributes

Para. Name:	**DE**	Lage-Istwert 2 (ext. Geber)		
	EN	Position feedback value 2 (ext. feedback)		
	FR	Valeur de retour de position 2 (externe)		
	ES	Valor real de posicion 2		
	IT	Feedback di Posizione Valore 2 (esterno)		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0054, Reference distance 2

The parameter displays the distance between the machine zero-point and the homing point for the external measuring system (Position feedback value 2). The parameter is used for the execution of the commands
S-0-0148, C600 Drive controlled homing procedure command and **P-0-0012, C300 Command 'Set absolute measurement'**.

During the command **S-0-0148, C600 Drive controlled homing procedure command**, the distance between the homing point and the machine zero-point is written there. If homing is done with run to the homing point, the drive goes to the homing point, and **S-0-0053, Position feedback value 2** contains the value of **S-0-0054, Reference distance 2**.

For the command **P-0-0012, C300 Command 'Set absolute measurement'**, the desired value for **S-0-0053, Position feedback value 2** is written there. After successful execution of 'Setting absolute measurement'**, S-0-0053, Position feedback value 2** shows the value of **S-0-0054, Reference distance 2**.

See also the functional description: "Drive-controlled homing".

S-0-0054 - Attributes

Para. Name:	**DE**	Referenzmaß Lage-Istwert 2		
	EN	Reference distance 2		
	FR	Distance de référence 2		
	ES	Medida de referencia valor de posicion 2		
	IT	Distanza di Riferimento 2		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0055, Position polarity parameter

This parameter can be used to invert the polarities of the given position data. These polarities are switched outside of the control system (i.e., at the input and output of the control system).

Note: The polarity of the position must be determined during the first setup of an axis *before* establishing a zero reference for the measurement systems, because changing the polarity results in different position values.

Note the following in reference to rotary motors:

"Motor-clockwise rotation" means the motor shaft turns in a clockwise direction (facing the motor shaft) if the position command value difference and the polarity are both positive.

The following applies to linear motors:

The positive direction is used when the primary is moving toward the linear motor power cable side

Bit 4 is used to activate or deactivate software position limits.

Parameter structure:

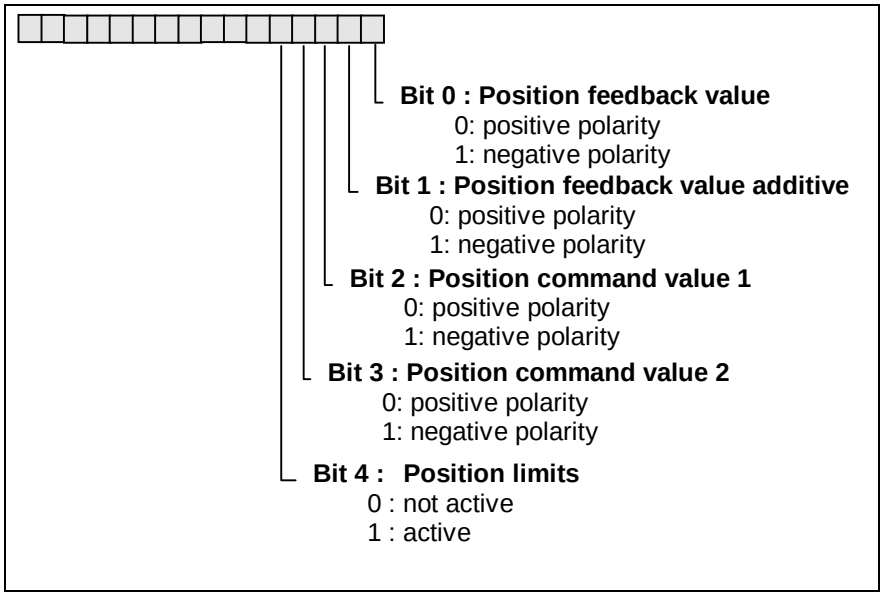
Bit 0 : Position feedback value
0: positive polarity
1: negative polarity
Bit 1 : Position feedback value additive
0: positive polarity
1: negative polarity
Bit 2 : Position command value 1
0: positive polarity
1: negative polarity
Bit 3 : Position command value 2
0: positive polarity
1: negative polarity
Bit 4 : Position limits
0 : not active
1 : active

Fig. 2-14: S-0-0055, Position polarity parameter

Note: - Only the bits indicated here are supported by the software.
- If bit 0 is changed by the control system, bits 1 - 3 will also be set to the value of bit 0 by the drive!

See also the functional description: "Command polarities and actual value polarities".

S-0-0055 - Attributes

Para. Name:	**DE**	Lage-Polaritäten-Parameter		
	EN	Position polarity parameter		
	FR	Paramètre de polarité de position		
	ES	Parametros de polaridad de posicion		
	IT	Parametro Direzione Posizionamento		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 15		
Default value:		0	**Cyc. transmittable:**	no

S-0-0057, Position window

The parameter S-0-0057, Position window, is used for following functions:

- Status **In Position**,
  |following error (S-0-0189)| < Position window (S-0-0057)
  → bit 6 in **S-0-0013, Class 3 Diagnostics**
- Status **ITP**,
  |Target - act.pos.| < Position window (S-0-0057) &&
  |following error| < Position window &&
  |act. speed| < Standstill window (S-0-0124)
  → bit 6 in **S-0-0182, Manufacturer class 3 diagnostics**
- Status In_Target_Position,
  |Target - act.pos.| < Position window (S-0-0057)
  → Bit 10 in **S-0-0182, Manufacturer class 3 diagnostics**
- During the execution of the command **S-0-0148, C600 Drive controlled homing procedure command**, the drive reports completion of the command, when the internal command generator has reached its target value and the difference between this value and the actual position is smaller than the position window.
- As a hysteresis window for the position limits. I.e., when the drive has gone beyond the limit, the travel range is additionally limited by the position window.

See also the functional description: "S-0-0182, Manufacturer Class 3 Diagnostics".

S-0-0057 - Attributes

Para. Name:	**DE**	Positionierfenster		
	EN	Position window		
	FR	Fenêtre de positionnement		
	ES	Ventana de posicionamiento		
	IT	Finestra di Posizionamento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		1000	**Cyc. transmittable:**	no

S-0-0058, Reversal clearance

The reversal clearance describes the amount of slack between the drive and the load when direction is changed, in respect to the position data. The processing depends from following data :

- **S-0-0124, Standstill window**,
- **S-0-0036, Velocity command value**, built by the position controller when it's active.

The following applies :

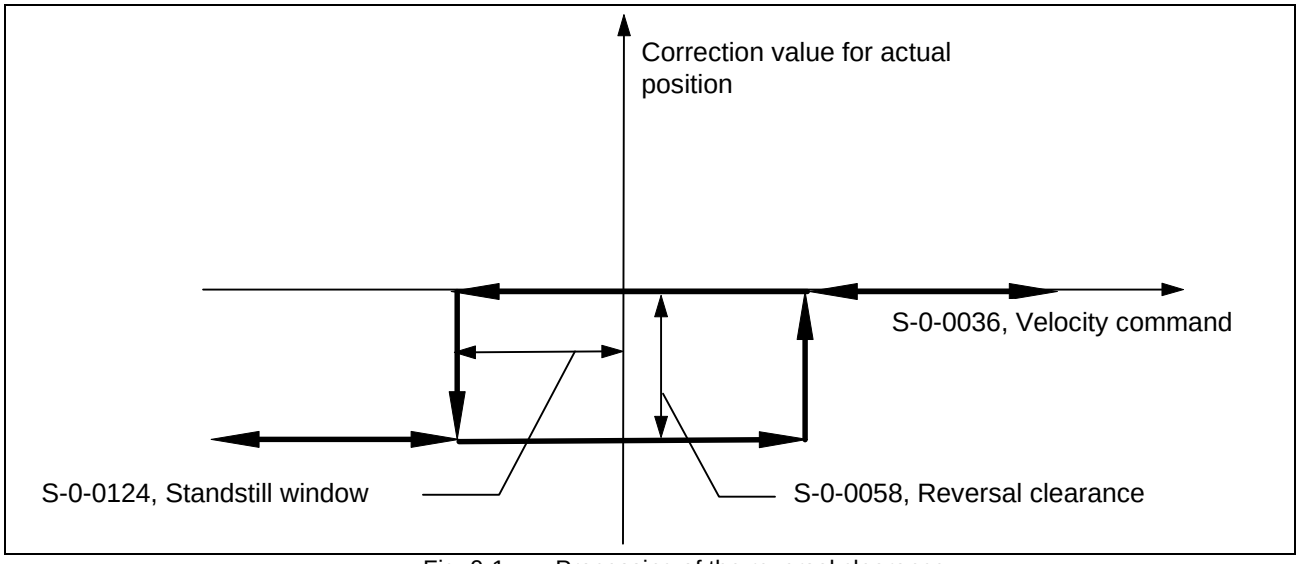

Fig. 0-1: Processing of the reversal clearance

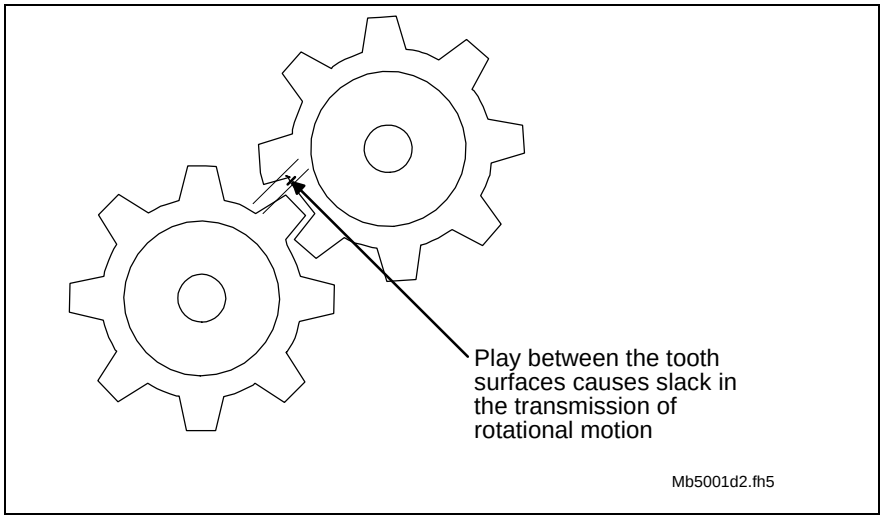

Fig. 2-15: Graphic representation of the motion play, or slack when direction is changed

See also the functional description: "Axis error correction".

S-0-0058 - Attributes

Para. Name:	**DE**	Umkehrspiel		
	EN	Reversal clearance		
	FR	Débattement inverse		
	ES	Juego de inversion		
	IT	Inversione Liberazione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase 3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0076, Position data scaling type

The position data scaling type determines, in which format position data are communicated between drive and control or display surface. When position parameters (e.g. **S-0-0051, Position feedback value 1**) are read, the drive displays them with the selected scaling. The scaling selection is usually preset by the PLC.

The following settings can be made:

Structure of the parameter:

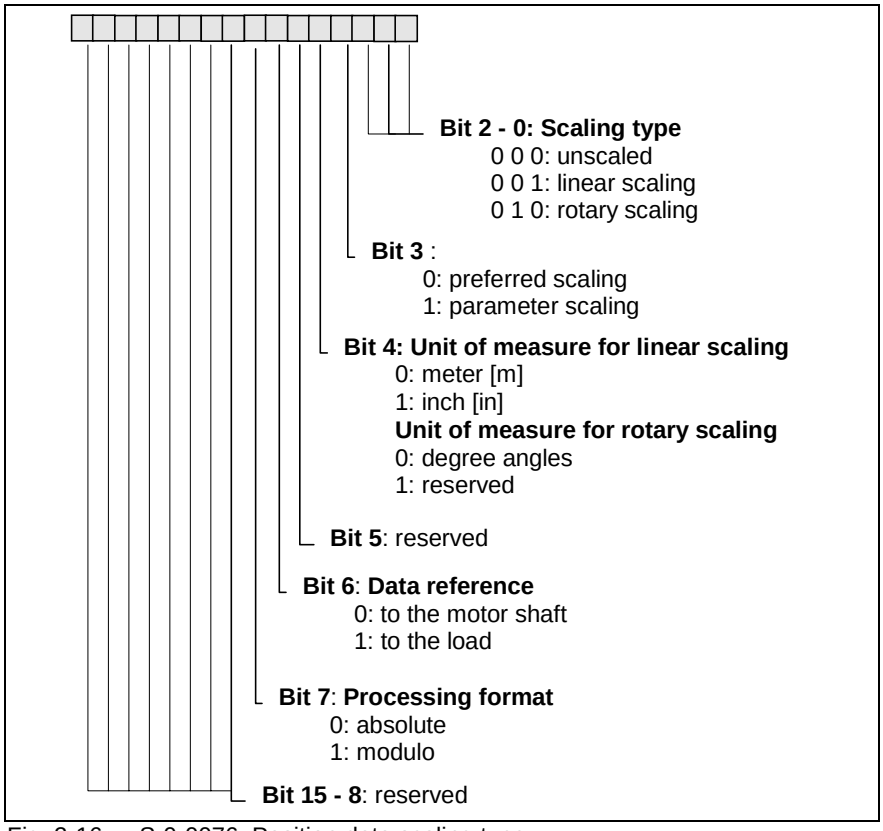
Bit 2 - 0: Scaling type
0 0 0: unscaled
0 0 1: linear scaling
0 1 0: rotary scaling
Bit 3 :
0: preferred scaling
1: parameter scaling
Bit 4: Unit of measure for linear scaling
0: meter [m]
1: inch [in]
Unit of measure for rotary scaling
0: degree angles
1: reserved
Bit 5: reserved
Bit 6: Data reference
0: to the motor shaft
1: to the load
Bit 7: Processing format
0: absolute
1: modulo
Bit 15 - 8: reserved

Fig. 2-16: S-0-0076, Position data scaling type

Note: Only the bits mentioned here are supported by the firmware.
1) See also **S-0-0045, Scaling factor for velocity data**.
2) See also the **example S-0-0077, Scaling of position data**.

See also the functional description: "Display Format of Position Data".

S-0-0076 - Attributes

Para. Name:	**DE**	Wichtungsart für Lagedaten		
	EN	Position data scaling type		
	FR	Type de calibrage pour données de position		
	ES	Tipo de escala para datos de posicion		
	IT	Tipo di Scala per Dati Posizionamento		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0100 0010b	**Cyc. transmittable:**	no

S-0-0077, Linear position data scaling factor

The parameter S-0-0077, Linear position data scaling factor determines together with **S-0-0078, Linear position data scaling exponent** and the selection of the physical unit m (meters) or inch in S-0-0076, in which unit the present position parameters in the drive are displayed, when linear scaling is selected.

If "**preferred scaling**" is chosen in **S-0-0076, Position data scaling type** (bit 3 = 0), the values in S-0-0077 and S-0-0078 are set by the drive.

If "**parameter scaling**" is chosen in **S-0-0076, Position data scaling type** (bit 3 = 1), the settings in S-0-0077 and S-0-0078 are taken.

Example for the display of position data for linear scaling:

- Physical position of the motor feedback equals 0.12 m (meter).

A) Selected scaling = linear preferred scaling (S-0-0077 = 1, S-0-0078 = -7). This gives for **S-0-0051, Position feedback value 1** a value of 1200000 with unit meters and 7 places after the decimal.

B) Selected scaling = linear parameter scaling (S-0-0077 = 3, S-0-0078 = -7). This gives for **S-0-0051, Position feedback value 1** a value of 400000 with unit meters and 7 places after the decimal.

See also the functional description: "Display Format of Position Data".

S-0-0077 - Attributes

Para. Name:	**DE**	Wichtungs-Faktor transl. Lagedaten		
	EN	Linear position data scaling factor		
	FR	Facteur de calibrage pour données de posit. lin.		
	ES	Factor de escala datos de posicion lineales		
	IT	Fattore di Scala per Posizionamenti lineare		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 65535		
Default value:		1	**Cyc. transmittable:**	no

S-0-0078, Linear position data scaling exponent

The parameter S-0-0078, Linear position data scaling exponent determines together with **S-0-0077, Linear position data scaling factor** and the selection of the physical unit m (meters) or inch in S-0-0076, in which unit the present position parameters in the drive are displayed, when linear scaling is selected.

If "**preferred scaling**" is chosen in **S-0-0076, Position data scaling type** (bit 3 = 0), the values in S-0-0077 and S-0-0078 are set by the drive.

If "**parameter scaling**" is chosen in **S-0-0076, Position data scaling type** (bit 3 = 1), the settings in S-0-0077 and S-0-0078 are taken.

Example for the display of position data for linear scaling:

- Physical position of the motor feedback equals 0.12 m (meter).

A) Selected scaling = linear preferred scaling (S-0-0077 = 1, S-0-0078 = -7). This gives for **S-0-0051, Position feedback value 1** a value of 1200000 with unit meters and 7 places after the decimal.

B) Selected scaling = linear parameter scaling (S-0-0077 = 1, S-0-0078 = -6). This gives for **S-0-0051, Position feedback value 1** a value of 120000 with unit meters and 6 places after the decimal.

See also the functional description: "Display Format of Position Data".

S-0-0078 - Attributes

Para. Name:	**DE**	Wichtungs-Exponent transl. Lagedaten		
	EN	Linear position data scaling exponent		
	FR	Exposant de calibrage pour données de posit. lin.		
	ES	Exponente de escala datos de posicion lineales		
	IT	Esponente per Dati Posizionamento lineare		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-32768 / 32768		
Default value:		-7	**Cyc. transmittable:**	no

S-0-0079, Rotational position resolution

If rotary position scaling is selected, the LSB valence for all position data will be set in this parameter. The valence of the LSB in the drive's position data results in

$$\text{LSB valence} = \frac{1\,\text{Revolution}}{\text{Rotational position resolution}}$$

where bit 6 of **S-0-0076, Position data scaling type** selects whether the LSb valence refers to one motor revolution or one load revolution.

If you work with preferred rotary scaling, the value in S-0-0079, Rotational position resolution is fixed at 3 600 000. Thus, the LSB bit of all rotary position data is fixed at 0.0001 degrees of angle.

See also the functional description: "Display Format of Position Data".

S-0-0079 - Attributes

Para. Name:	**DE**	Rotations-Lageauflösung		
	EN	Rotational position resolution		
	FR	Résolution de position rotationnelle		
	ES	Resolucion de posicion de rotacion		
	IT	Risoluzione per Posizionamenti circolari		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 4294967295		
Default value:		3600000	**Cyc. transmittable:**	no

S-0-0080, Torque/force command

In the torque control operating mode, the torque command values are transferred by the control system to the drive.

If the velocity controller is active, the torque required for the corresponding velocity can be derived from this parameter.

At present, only the **percentage-based scaling** is supported.

The date value corresponds to the current command value in respect to the motor current at standstill (S-0-0111).

The value can be converted to a torque or force value by multiplying the command current by the torque/force constant (P-0-0051).

See also the functional description: "Torque/force controller".

S-0-0080 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Sollwert		
	EN	Torque/force command		
	FR	Valeur de commande de couple/force		
	ES	Valor nominal de par de giro/fuerza		
	IT	Comando Coppia/Forza		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0086	**Extrem value check:**	yes
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		S-0-0109/110 / S-0-0109/110		
Default value:		---	**Cyc. transmittable:**	no

S-0-0084, Torque/force feedback value

The current torque/force feedback value can be derived from this parameter.

The shown values depend from the torque/force scaling. At present, only the **percentage-based scaling** is supported.

The data value corresponds to the measured feedback current; 100% are equal to the motor current at standstill, S-0-0111.

The value can be converted to a torque or force value by multiplying the command current by the torque/force constant P-0-0051.

S-0-0084 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Istwert		
	EN	Torque/force feedback value		
	FR	Valeur de retour de couple/force		
	ES	Par de giro/valor de retroalimentacion de fuerza		
	IT	Valore di Feedback Coppia/Forza		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0086	**Extrem value check:**	no
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0085, Torque/force polarity parameter

The polarities for the given torque data as related to the application can be switched in this parameter.

Polarities are switched externally, at the input and output of a control system rather than inside the system.

The following applies to rotary (turning) motors:

The motor will turn in a clockwise direction (facing the motor shaft) with a positive torque command value and positive polarity.

The following applies to linear motors:

The positive direction is used when the primary is moving toward the linear motor power cable side

Structure of the parameter:

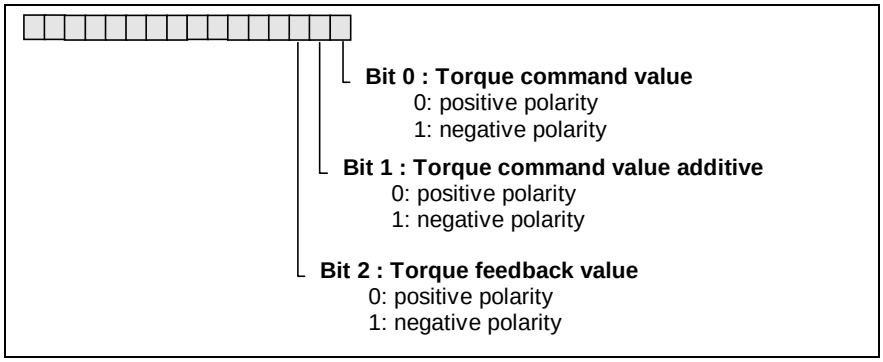
Bit 0 : Torque command value
0: positive polarity
1: negative polarity
Bit 1 : Torque command value additive
0: positive polarity
1: negative polarity
Bit 2 : Torque feedback value
0: positive polarity
1: negative polarity

Fig. 2-17: S-0-0085, Torque/force polarity parameter

Note: If bit 0 of the control system is changed, then bits 1 - 2 of the drive will also be set to the value in bit 0.

See also the functional description: "Command polarities and actual value polarities".

S-0-0085 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Polaritäten-Parameter		
	EN	Torque/force polarity parameter		
	FR	Paramètre de polarité de couple/force		
	ES	Par de giro/fuerza parametro de polaridad		
	IT	Polarità Coppia/Forza		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 7		
Default value:		0	**Cyc. transmittable:**	no

S-0-0086, Torque/force data scaling type

At present, only the **percentage** scaling for torque/force data is supported.

The following applies:

100 % = S-0-0111, Motor current at standstill

See also the functional description: "Adjustable scaling for position, velocity, and acceleration data".

S-0-0086 - Attributes

Para. Name:	**DE**	Wichtungsart für Drehmoment-/Kraftdaten		
	EN	Torque/force data scaling type		
	FR	Type de calibrage pour données de couple/force		
	ES	Par de giro/fuerza tipo de escala de datos		
	IT	Tipo di Scala per Dati Coppia/Forza		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0088, Receive to receive recovery time (TMTSG)

This parameter defines the time needed for the slave to switch to readiness for the next master synchronization telegram after receiving a master data telegram.

The parameter is read by the control system in phase 2 to calculate the time slot parameters.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0088 - Attributes

Para. Name:	**DE**	TMTSY Erholzeit Empfangen-Empfangen		
	EN	Receive to receive recovery time (TMTSG)		
	FR	Temps de récupération entre deux réceptions (TMTSY)		
	ES	TMTSY Tiempo de recuperacion recepcion-recepcion		
	IT	Tempo di Recupero Ricettore a Ricettore (TMTSG)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0089, MDT Transmit starting time (T2)

This is the transmit starting time for the master data telegram after the end of a master synchronization telegram. The value is transferred from the master to the slave in communications phase 2 and is activated in phase 3.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0089 - Attributes

Para. Name:	**DE**	T2 Sendezeitpunkt MDT		
	EN	MDT Transmit starting time (T2)		
	FR	Temps du départ de transmission du MDT (T2)		
	ES	T2 Punto temporal de emision MDT		
	IT	MDT Tempo Partenza Trasmissione (T2)		
Function:		Parameter	**Editability:**	P2
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase2
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65000		
Default value:		1500	**Cyc. transmittable:**	no

S-0-0090, Command value transmit time (TMTSG)

This is the time required by the slave to prepare the command values for the drive after reception of the master data telegram.

See also the functional description: "Configuration of the Telegram Send and Receive Times"

S-0-0090 - Attributes

Para. Name:	**DE**	TMTSG Kopierzeit Sollwerte		
	EN	Command value transmit time (TMTSG)		
	FR	TMTSG Temps de recopie de consigne		
	ES	TMTSG Tiempo de copia valores nominales		
	IT	Tempo di Trasmissione Valore comandato (TMTSG)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0091, Bipolar velocity limit value

The "bipolar velocity limit value" describes the maximum permissible velocity, symmetrical in both directions. The max. input value is determined by the **S-0-0113, Maximum motor speed (nmax)**.

The entered value generates the maximum value for all other speed parameters.

See also the functional description: "Limiting Velocity"

S-0-0091 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Grenzwert bipolar		
	EN	Bipolar velocity limit value		
	FR	Limite de vitesse bipolaire		
	ES	Valor limite de velocidad bipolar		
	IT	Valore di Velocità Limite		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0113		
Default value:		1000000	**Cyc. transmittable:**	MDT

S-0-0092, Bipolar torque/force limit value

This parameter describes the maximum allowable torque symmetrical in both directions (accelerating, braking).

The evaluation refers to the percentage of the motor current at standstill:

100 % = Motor current at standstill

Note: The maximum torque is also influenced by
- **P-0-0006, Overload factor**
- **P-0-4011, Switching frequency**

See also the functional description: "Torque/Force Limiting".

S-0-0092 - Attributes

Para. Name:	**DE**	Drehmoment/Kraft-Grenzwert bipolar		
	EN	Bipolar torque/force limit value		
	FR	Limite de couple/force bipolaire		
	ES	Valor limite par de giro/fuerza bipolar		
	IT	Valore di Coppia/Forza Limite		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0086	**Extrem value check:**	yes
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		S-0-0109/110 / S-0-0109/110		
Default value:		4000	**Cyc. transmittable:**	MDT

S-0-0093, Torque/force data scaling factor

The scaling factor for all torque/force data in the drive is set in this parameter.

The parameter has no meaning at the present time, because only **percentage scaling** can be set for torque and force data. Therefore, only the value 1 is suitable.

See also the functional description: "Adjustable scaling for position, velocity, and acceleration data".

S-0-0093 - Attributes

Para. Name:	**DE**	Wichtungs-Faktor für Drehmoment-Kraftdaten		
	EN	Torque/force data scaling factor		
	FR	Facteur de calibrage pour données de couple/force		
	ES	Factor de escala para datos par de giro/fuerza		
	IT	Fattore di Scala per Dati Coppia/Forza		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 1		
Default value:		1	**Cyc. transmittable:**	no

S-0-0094, Torque/force data scaling exponent

The scaling exponent for all torque/force data in the drive is set in this parameter.

The parameter has no meaning at the present time, because only **percentage scaling** can be set for torque and force data.

See also the functional description: "Adjustable scaling for position, velocity, and acceleration data".

S-0-0094 - Attributes

Para. Name:	**DE**	Wichtungs-Exponent für Drehmoment-Kraftdaten		
	EN	Torque/force data scaling exponent		
	FR	Exposant de calibrage pour données de couple/force		
	ES	Exponente de escala para datos de par de giro/fuerza		
	IT	Esponente per Dati Coppia/Forza		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-1 / -1		
Default value:		-1	**Cyc. transmittable:**	no

S-0-0095, Diagnostic message

This parameter contains the currently relevant operating status of the drive in **text** form.

The respective diagnostic message number from **S-0-0390, Diagnostic message number** will appear in front of the operating status.

Example:

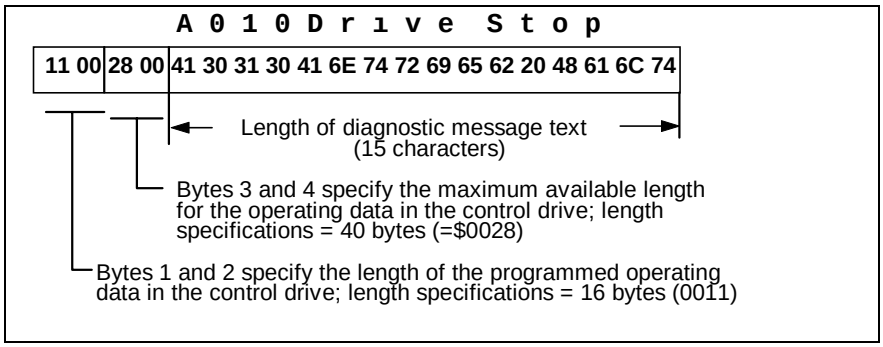
A 0 1 0 D r ı v e S t o p
11 00 28 00 41 30 31 30 41 6E 74 72 69 65 62 20 48 61 6C 74
Length of diagnostic message text (15 characters)
Bytes 3 and 4 specify the maximum available length for the operating data in the control drive; length specifications = 40 bytes (=$0028)
Bytes 1 and 2 specify the length of the programmed operating data in the control drive; length specifications = 16 bytes (0011)

Fig. 2-18: S-0-0095, Diagnostic message

See also the functional description: "Diagnostic Message Composition"

S-0-0095 - Attributes

Para. Name:	**DE**	Diagnose		
	EN	Diagnostic message		
	FR	Message de diagnostic		
	ES	Diagnostico		
	IT	Messaggio di Diagnosi		
Function:		Parameter	**Editability:**	no
Data length:		1Byte variabel	**Memory:**	no
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0096, Slave arrangement (SLKN)

For Sercos: During initialization, the master must know which drives are available under which slave numbers in order to execute an optimal automatic time slot calculation.

The master uses this information to detect the **address** of the connected slave.

Example for address 3:

03	**03**

See also the functional description: "Setting the drive address"

S-0-0096 - Attributes

Para. Name:	**DE**	Slavekennung (SLKN)		
	EN	Slave arrangement (SLKN)		
	FR	Reconnaissance d'esclave (SLKN)		
	ES	Disposicion de esclavo (SLKN)		
	IT	Preparazione Slave (SLKN)		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0097, Mask class 2 diagnostic

This parameter can be used to mask pre-warnings in **S-0-0012, Class 2 diagnostics** in the drive status according to their effect on the change bit. When changes are made to the masked early warnings, the Class 2 diagnostic change bit will be set in the drive status.

The mask has no effect on the operating data of the Class 2 diagnostic.

See also the functional description: "Class 2 and 3 Diagnostic Change Bits in the Drive Status Word".

S-0-0097 - Attributes

Para. Name:	**DE**	Maske Zustandsklasse 2		
	EN	Mask class 2 diagnostic		
	FR	Diagnostic de classe 2, masque		
	ES	Mascara diagnostico clase 2		
	IT	Maschera Diagnosi Classe 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0098, Mask class 3 diagnostic

This parameter can be used to mask pre-warnings in **S-0-0013, Class 3 diagnostics** in the drive status according to their effect on the change bit. When changes are made to the masked early warnings, the Class 3 diagnostic change bit will be set in the drive status.

The mask has no effect on the operating data of the Class 3 diagnostic.

See also the functional description: "Class 2 and 3 Diagnostic Change Bits in the Drive Status Word".

S-0-0098 - Attributes

Para. Name:	**DE**	Maske Zustandsklasse 3		
	EN	Mask class 3 diagnostic		
	FR	Diagnostic de classe 3, masque		
	ES	Mascara diagnostico clase 3		
	IT	Maschera Diagnosi Classe 3		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0099, C500 Reset class 1 diagnostic

If the drive receives this command via the service channel, then the Class 1 diagnostic, the interface status, and the drive lock will be deleted in the drive status, if no more errors are pending.

See also the functional description: "Clearing errors".

S-0-0099 - Attributes

Para. Name:	**DE**	C500 Reset Zustandsklasse 1		
	EN	C500 Reset class 1 diagnostic		
	FR	C500 Remise à zéro pour diagnostic de classe 1		
	ES	C500 Reset diagnostico clase 1		
	IT	C500 Cancellare Errori Classe 1		
Function:		Command	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0100, Velocity loop proportional gain

This parameter contains the value for the velocity loop proportional gain.

The proportional gain **unit** depends on the contacted motor type.

Motor type:	**Unit:**
Rotary motor:	A*sec/rad
Linear motor:	A*min/m

Fig. 2-19: Units for motor types

It is possible to load a default value for the parameter using the command "Basic load", as long as a motor is available with feedback memory (**P-0-4014, Motor type:** 1 or 5).

See also the functional description: "Setting the velocity controller".

S-0-0100 - Attributes

Para. Name:	**DE**	Geschwindigkeitsregler-Proportionalverstärkung		
	EN	Velocity loop proportional gain		
	FR	Gain proportionnel de la boucle de vitesse		
	ES	Amplificacion proporcional de regulador de velocidad		
	IT	Guadagno proporzionale Anello di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		As/rad	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 6553.5		
Default value:		10	**Cyc. transmittable:**	no

S-0-0101, Velocity loop integral action time

The velocity controller forms a current command value from the difference between the velocity command value and the velocity feedback value

(= speed regulation deviation).

This current command value consists of a proportional component and an integral component. The Velocity Loop Integral Action Time corresponds to the time in which the integral component of the current command value is growing on the value of the proportional component.

Definition of the Integral Action Time

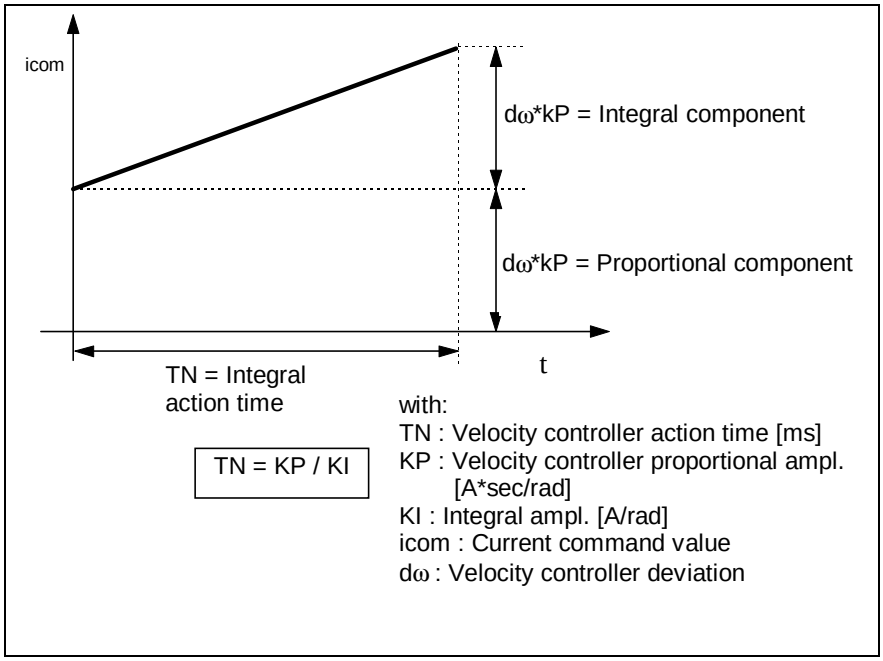
icom
dω*kP = Integral component
dω*kP = Proportional component
t
TN = Integral action time
TN = KP / KI
with:
TN : Velocity controller action time [ms]
KP : Velocity controller proportional ampl. [A*sec/rad]
KI : Integral ampl. [A/rad]
icom : Current command value
dω : Velocity controller deviation

Fig. 2-20: Integral Action Time

The value of the time axis for which the integral component is equal to the proportional component is described as integral action time. This represents the time that a pure I-controller would need until the controller output variable is equal to the output variable of a P-controller at time t = 0.

The integral gain component is disabled with an input value of 0.

See also the functional description: "Setting the velocity controller".

S-0-0101 - Attributes

Para. Name:	**DE**	Geschwindigkeitsregler-Nachstellzeit		
	EN	Velocity loop integral action time		
	FR	Temps d'action intégral de la boucle de vitesse		
	ES	Tiempo de reajuste de regulador de velocidad		
	IT	Tempo Integrazione Anello di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 6553.5		
Default value:		100	**Cyc. transmittable:**	no

S-0-0103, Modulo value

When the modulo format is set (parameter **S-0-0076, Position data scaling type** bit 7), the modulo value determines at which numeric value the position data roll over (overflow) to 0.

See also parameter "**S-0-0393, Command value mode for modulo format**"

See also the functional description: "Modulo feature".

S-0-0103 - Attributes

Para. Name:	**DE**	Modulowert		
	EN	Modulo value		
	FR	Valeur modulo		
	ES	Valor de modulo		
	IT	Valore Modulo		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		3600000	**Cyc. transmittable:**	no

S-0-0104, Position loop Kv-factor

This parameter contains the value for the proportional gain of the position controller.

It is possible to load a default value for the controller parameters using the command "Basic load".

Motors with feedback memory (**P-0-4014, Motor type** 1 or 5), e.g. MKD, have appropriate values for all controller settings in their feedback. These are loaded after the initial connection (display UL) or with the command "Basic load".

See also the functional description: "Setting the position controller".

S-0-0104 - Attributes

Para. Name:	**DE**	Lageregler Kv-Faktor		
	EN	Position loop Kv-factor		
	FR	Gain proportionnel de la boucle de position, Kv		
	ES	Regulador de posicion factor Kv		
	IT	Fattore Kv Anello di Posizione		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		1000/min	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 655.35		
Default value:		100	**Cyc. transmittable:**	no

S-0-0106, Current loop proportional gain 1

The current controller proportional gain is determined for every motor-drive combination. It depends on the type of the motor and may not be changed. It is loaded from the motor feedback after the initial connection (display UL) or using the command "Basic load".

Note: The values set at the factory should not be altered!

See also function description: "Setting the Current Controller".

S-0-0106 - Attributes

Para. Name:	**DE**	Stromregler-Proportionalverstärkung 1		
	EN	Current loop proportional gain 1		
	FR	Gain proportionnel de la boucle de courant 1		
	ES	Amplificacion proporcional 1 regulador de corriente		
	IT	Guadagno proporzionale 1 Regolatore di Corrente		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		V/A	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 655.35		
Default value:		100	**Cyc. transmittable:**	no

S-0-0107, Current loop integral action time 1

The current loop integral action time is fixed for every motor-drive combination. It depends on the type of the motor. The factory setting may not be changed.

The basic setup for all controllers is loaded after the initial connection (display UL) or with the command "Basic load“. For motors without feedback memory, you can take the value from the motor’s data sheet.

See also function description: "Setting the Current Controller".

S-0-0107 - Attributes

Para. Name:	**DE**	Stromregler-Nachstellzeit 1		
	EN	Current loop integral action time 1		
	FR	Temps d'action intégral de la boucle de courant 1		
	ES	Tiempo de reajuste de regulador de corriente 1		
	IT	Tempo Integrazione 1 Anello di Corrente		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 6553.5		
Default value:		100	**Cyc. transmittable:**	no

S-0-0108, Feedrate override

The feedrate override acts on drive controlled operation modes and motion commands, like

- **S-0-0148, C600 Drive controlled homing procedure command**
- operating modes **Drive internal interpolation** and **Relative drive internal interpolation**
- Programmed **positioning block** operating mode
- Jogging operation
- automatic control loop setting
- speed synchronization during angle synchronization

The versions have not implemented all operating modes and commands at the same time.

The feedrate override has a **multiplying** effect on the parameters

- **S-0-0041, Homing velocity**
- **S-0-0259, Positioning velocity**
- Positioning block velocities
- Jog velocity

Note: Devices with analog interface are equipped with an analog input for the feedrate override, see Project Manual. It is activated by setting the bit 0 in the function parameter, P-0-4027.
Bit 0 = 0: Feedrate override set in parameter S-0-0108
Bit 0 = 1: Feedrate override via analog channel

See also the functional description: "Drive-Controlled Homing"

S-0-0108 - Attributes

Para. Name:	**DE**	Feedrate-Override		
	EN	Feedrate override		
	FR	Atténuateur d'avance		
	ES	Override de alimentacion		
	IT	Riduzione Velocità Avanzamento		
Function:		Parameter	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		%	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 655.35		
Default value:		---	**Cyc. transmittable:**	no

S-0-0109, Motor peak current

Specifies the maximum current which may flow through the motor for a short period without damaging it.

If the motor's peak current is less than the amplifier's peak current, the maximum output current will be automatically limited to the motor's peak current.

This value is stored in the motor feedback for MDD, MKD and MKE motors and will be uploaded from there when the amplifier is turned on for the first time. For other motor types, the value must be taken from the data sheet.

See also the functional description: "Active peak current".

S-0-0109 - Attributes

Para. Name:	**DE**	Spitzenstrom Motor		
	EN	Motor peak current		
	FR	Courant crête du moteur		
	ES	Corriente punta de motor		
	IT	Corrente di Picco Motore		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		1000	**Cyc. transmittable:**	no

S-0-0110, Amplifier peak current

Peak current available from the drive controller. The value will be set by the drive itself. This current is only available for short durations.

See also the functional description: "Current Limit".

S-0-0110 - Attributes

Para. Name:	**DE**	Spitzenstrom Verstärker		
	EN	Amplifier peak current		
	FR	Courant crête du variateur		
	ES	Corriente punta amplificador		
	IT	Corrente di Picco Azionamento		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		---	**Cyc. transmittable:**	no

S-0-0111, Motor current at standstill

The motor current at standstill is the current from which the motor continuously generates the standstill torque according to the motor data sheet.

This value is stored in motor feedback for MDD, MKD and MKE motors and will be loaded from there when the drive controller is turned on for the first time. For other types of motors, this value must be taken from the data sheet.

All **torque/force data** refer to this **motor current at standstill = 100 %** .

See also the functional description: "Motor Feedback-Data Memory"

S-0-0111 - Attributes

Para. Name:	**DE**	Stillstandsstrom Motor		
	EN	Motor current at standstill		
	FR	Courant du moteur à l'arrêt		
	ES	Corriente de parada motor		
	IT	Corrente Motore con Asse fermo		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		1000	**Cyc. transmittable:**	no

S-0-0112, Amplifier nominal current

Allowable continuous current output for the drive controller. The value will be set by the drive itself.

See also the functional description: "Setting the Active Continuous Current"

S-0-0112 - Attributes

Para. Name:	**DE**	Nennstrom Verstärker		
	EN	Amplifier nominal current		
	FR	Courant nominal variateur		
	ES	Corriente nominal amplificador		
	IT	Corrente nominale Azionamento		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		---	**Cyc. transmittable:**	no

S-0-0113, Maximum motor speed (nmax)

The maximum velocity for the motor cannot be exceeded. It also limits the **S-0-0091, Bipolar velocity limit** parameter.

This value is stored in the motor feedback of MDD, MKD and MKE motors and will be loaded from there when the drive controller is turned on for the first time. For other motor types, the value must be taken from the data sheet.

In torque regulation, if the maximum motor speed is exceeded by more than 12.5%, the drive will be switched into a torque free state and the error message **F879 Velocity limit S-0-0091 exceeded** will result.

See also the functional description: "Limiting Velocity".

S-0-0113 - Attributes

Para. Name:	**DE**	Maximalgeschwindigkeit des Motors		
	EN	Maximum motor speed (nmax)		
	FR	Vitesse maximale du moteur		
	ES	Velocidad maxima del motor		
	IT	Velocità massima Motore (nmax)		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / 214738.3647		
Default value:		1000000	**Cyc. transmittable:**	no

S-0-0115, Position feedback 2 type parameter

Essential characteristics of the external encoder (position encoder 2) are established is this parameter.

Parameter structure:

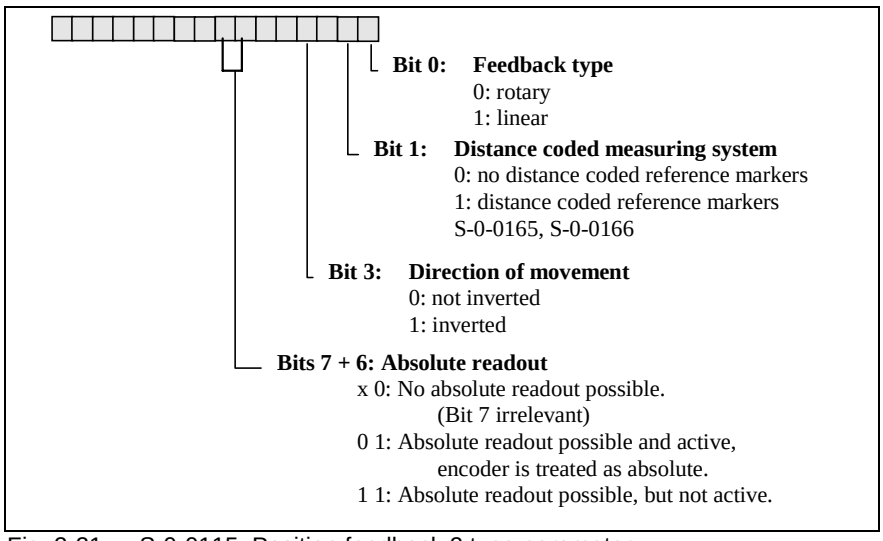
Bit 0: Feedback type
0: rotary
1: linear
Bit 1: Distance coded measuring system
0: no distance coded reference markers
1: distance coded reference markers
S-0-0165, S-0-0166
Bit 3: Direction of movement
0: not inverted
1: inverted
Bits 7 + 6: Absolute readout
x 0: No absolute readout possible.
(Bit 7 irrelevant)
0 1: Absolute readout possible and active,
encoder is treated as absolute.
1 1: Absolute readout possible, but not active.

Fig. 2-21: S-0-0115, Position feedback 2 type parameter

Remark:

For absolute measurement systems with data memory, bit 6 is set automatically.

Note: Only the bits indicated here are supported by the software.

See also the functional description: "Other External Encoder Characteristics".

S-0-0115 - Attributes

Para. Name:	**DE**	Lagegeberart-Parameter 2		
	EN	Position feedback 2 type parameter		
	FR	Paramètre type codeur 2		
	ES	Tipo de encoder de posicion parametro 2		
	IT	Tipo di Feedback di Posizione 2		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0116, Resolution of motor feedback

Depending on parameter **P-0-4014, Motor type** (rotary or linear motors), the resolution of the motor encoder is indicated by **S-0-0116, Resolution of motor feedback**.

This value contains the number of cycles per motor revolution for rotary motors, or the segment spacing per mm for linear motors.

See also the functional description: "Motor encoder resolution".

S-0-0116 - Attributes

Para. Name:	**DE**	Auflösung Motorgeber		
	EN	Resolution of motor feedback		
	FR	Résolution du codeur moteur		
	ES	Resolucion encoder de motor		
	IT	Risoluzione Feedback Motore		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Cycles/rev	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		256	**Cyc. transmittable:**	no

S-0-0117, Resolution of external feedback

The resolution of the external encoder contains the cycles per external encoder revolution for rotational encoders. For linear external encoders, the segment spacing is given, in mm.

See also the functional description: "External Encoder Resolution".

S-0-0117 - Attributes

Para. Name:	**DE**	Auflösung externer Geber		
	EN	Resolution of external feedback		
	FR	Résolution du codeur externe		
	ES	Resolucion encoder externo		
	IT	Risoluzione Feedback esterno		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Cycles/rev	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		256	**Cyc. transmittable:**	no

S-0-0121, Input revolutions of load gear

A mechanical gear is often employed between the motor and the load.

The **gear ratio** is defined by:

$$\frac{\text{S-0-0122, Output Revolutions of load Gear}}{\text{S-0-0121, Input Revolutions of load Gear}}$$

Fig. 2-22: Gear Ratio

See also function description: "Transmission Ratio" and "Modulo Processing-Limiting Conditions".

Example:

5 motor rotations result in 2 output gear rotations.

⇒ S-0-0121 : 5

S-0-0122 : 2

S-0-0121 - Attributes

Para. Name:	**DE**	Lastgetriebe-Eingangsumdrehungen		
	EN	Input revolutions of load gear		
	FR	Nombre de tours d'entrée d'engrenages de charge		
	ES	Giros de entrada de engranaje de carga		
	IT	N di Giri in Ingresso al Riduttore		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 4294967295		
Default value:		1	**Cyc. transmittable:**	no

S-0-0122, Output revolutions of load gear

A mechanical gear is often employed between the motor and the load.

The **gear ratio** is defined by:

$$\frac{\text{S-0-0122, Output Revolutions of load Gear}}{\text{S-0-0121, Input Revolutions of load Gear}}$$

Fig. 2-23: Gear Ratio

See also function description: "Transmission Ratio" and "Modulo Processing-Limiting Conditions".

Example:

5 motor rotations result in 2 output gear rotations.

⇒ S-0-0121 : 5
S-0-0122 : 2

S-0-0122 - Attributes

Para. Name:	**DE**	Lastgetriebe-Ausgangsumdrehungen		
	EN	Output revolutions of load gear		
	FR	Nombre de tours de sortie d'engrenages de charge		
	ES	Giros de salida de engranaje de carga		
	IT	N di Giri in Uscita del Riduttore		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 4294967295		
Default value:		1	**Cyc. transmittable:**	no

S-0-0123, Feed constant

This parameter describes the conversion from rotary to linear motion. It is defined as the linear displacement of the load during one revolution of the gear drive shaft.

Characteristic value:

Ball screw spindle:	Rack and pinion:
Feed constant = pitch of screw (typical value 10.00 mm)	Feed constant = effective pitch diameter of the pinion • π = effective circumference of the pinion

Fig. 2-24: Characteristic values of the feed constant

Note: The **unit** is dependent on bit 4 in **S-0-0076, Position data scaling type**.

Note that: S-0-0076 bit 4 = 0 → mm/rev
S-0-0076 bit 4 = 1 → inch/rev

See also the functional description: "Feed constant".

S-0-0123 - Attributes

Para. Name:	**DE**	Vorschubkonstante		
	EN	Feed constant		
	FR	Constante d'avance		
	ES	Constante de avance		
	IT	Costante di Avanzamento		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		5	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0124, Standstill window

The motors standstill is an indication that the **velocity feedback value, (S-0-0040)** has reached below the pre-define threshold level in S-0-0125.

Bit 1 of the **S-0-0013, Class 3 diagnostics** is set during standstill.

See also the functional description: "S-0-0182, Manufacturer class 3 diagnostic"

S-0-0124 - Attributes

Para. Name:	**DE**	Stillstandsfenster		
	EN	Standstill window		
	FR	Fenêtre d'arrêt		
	ES	Ventana de parada		
	IT	Finestra di monitorizzazione Asse fermo		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0044		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0125, Velocity threshold nx

If the **S-0-0040, Velocity feedback value** falls below the value of the parameter **S-0-0125, Velocity threshold nx**, the drive sets the message n_actual < nx (Bit 2 in **S-0-0013, Class 3 Diagnostics**).

See also the functional description: "S-0-0127, C1 Communication Phase 3 Transition Check"

S-0-0125 - AttributesDummysprungDE

Para. Name:	**DE**	Geschwindigkeits-Schwelle nx		
	EN	Velocity threshold nx		
	FR	Seuil de vitesse nx		
	ES	Umbral de velocidad nx		
	IT	Finestra di Controllo Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Prog.-Modul
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0044		
Default value:		10000000	**Cyc. transmittable:**	no

S-0-0127, C100 Communication phase 3 transition check

The master (control system) uses this command to tell the slave (drive) that it has transmitted all of the necessary communications parameters for communications phase 3. After receiving this command, the slave checks to see whether error-free operation is possible in communication phase 3 from the slave's point of view.

The command is completed error-free if the slave is ready to follow the prompt in communication phase 3 MST and to maintain the structure of the telegram. If this is not the case, then the command ends with an error.

The control system erases the command after acknowledgement of a positive command. Not until then does the control system move into communications phase 3 in the MST.

See also the functional description: "S-0-0127, C1 Communication Phase 3 Transition Check"

S-0-0127 - Attributes

Para. Name:	**DE**	C100 Umschaltvorbereitung auf Komm.-Phase 3		
	EN	C100 Communication phase 3 transition check		
	FR	C100 Préparation transition phase de comm. 3		
	ES	C100 Comprobacion de conmutacion a fase 3		
	IT	C100 Check Transizione Fase di Comunicazione 3		
Function:		Command	**Editability:**	P2
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0128, C200 Communication phase 4 transition check

The master (control system) uses this command to tell the slave (drive) that it has transmitted all of the necessary communications parameters for communications phase 4. After receiving this command, the slave checks to see whether error-free operation is possible in communication phase 4 from the slave's point of view.

The command will be completed error-free if the slave is ready for the cyclical operation in communications phase 4.

The control system erases the command after acknowledgement of a positive command. Afterwards the control system moves into communications phase 4 in the MST.

See also the functional description: "S-0-0128, C2 Communication Phase 4 Transition Check".

S-0-0128 - Attributes

Para. Name:	**DE**	C200 Umschaltvorbereitung auf Komm.-Phase 4		
	EN	C200 Communication phase 4 transition check		
	FR	C200 Préparation transition phase de comm. 4		
	ES	C200 comprobacion de conmutacion a fase 4		
	IT	C200 Check Transizione Fase di Comunicazione 4		
Function:		Command	**Editability:**	P3
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0130, Probe value 1 positive edge

The drive uses the positive edge of the input signal from **S-0-0130, Probe value 1 positive edge**, to store the instantaneous value of the selected signal in this parameter.

The signal to be measured is determined by parameters **P-0-0200, Signal select probe 1** and **S-0-0169, Probe control parameter**.

See also the functional description: "Probe Input Feature".

S-0-0130 - Attributes

Para. Name:	**DE**	Messwert 1 positiv		
	EN	Probe value 1 positive edge		
	FR	Mesure sonde 1 front montant		
	ES	Valor de medicion 1 positivo		
	IT	Misura Valore con Probe 1 positivo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0200	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0200	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0131, Probe value 1 negative edge

The drive uses the negative edge of the input signal from **S-0-0401, Probe 1**, to store the instantaneous value of the selected signal in this parameter.

The signal to be measured is determined by parameters **P-0-0200, Signal select probe 1** and **S-0-0169, Probe control parameter**.

See also the functional description: "Probe Input Feature".

S-0-0131 - Attributes

Para. Name:	**DE**	Messwert 1 negativ		
	EN	Probe value 1 negative edge		
	FR	Mesure sonde 1 front descendant		
	ES	Valor de medicion 1 negativo		
	IT	Misura Valore con Probe 1 negativo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0200	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0200	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0132, Probe value 2 positive edge

The drive uses the positive edge of the input signal from **S-0-0402, Probe 2**, to store the instantaneous value of the selected signal in this parameter.

The signal to be measured is determined by parameters **P-0-0201, Signal select probe 2** and **S-0-0169, Probe control parameter**.

See also the functional description: "Probe Input Feature".

S-0-0132 - Attributes

Para. Name:	**DE**	Messwert 2 positiv		
	EN	Probe value 2 positive edge		
	FR	Mesure sonde 2 front montant		
	ES	Valor de medicion 2 positivo		
	IT	Misura Valore con Probe 2 positivo		
Function:		Parameter	**Editability:**	-
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0201	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0201	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0133, Probe value 2 negative edge

The drive uses the negative edge of the input signal from **S-0-0402, Probe 2**, to store the instantaneous value of the selected signal in this parameter.

The signal to be measured is determined by parameters **P-0-0201, Signal select probe 2** and **S-0-0169, Probe control parameter**.

See also the functional description: "Probe Input Feature".

S-0-0133 - Attributes

Para. Name:	**DE**	Messwert 2 negativ		
	EN	Probe value 2 negative edge		
	FR	Mesure sonde 2 front descendant		
	ES	Valor de medicion 2 negativo		
	IT	Misura Valore con Probe 2 negativo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0201	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0201	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0134, Master control word

The parameter S-0-0134, Master control word, shows a copy of the cyclically transmitted master control word of the Master Data Telegram. For troubleshooting, the master control word can be read via the service channel.

See also the functional description: "Master control word".

S-0-0134 - Attributes

Para. Name:	**DE**	Master-Steuerwort		
	EN	Master control word		
	FR	Mot de contrôle maître		
	ES	Palabra de mando maestro		
	IT	Word di Controllo Master		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0135, Drive status word

This makes it possible to display the drive status word via the service channel on the display screen of the NC. Help for setup and troubleshooting.

See also the functional description: "Drive Status Word"

S-0-0135 - Attributes

Para. Name:	**DE**	Antriebs-Status		
	EN	Drive status word		
	FR	Etat entraînement		
	ES	Estado de accionamiento		
	IT	Stato Azionamento		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0138, Bipolar acceleration limit value

The Bipolar acceleration limit value describes the maximum permissible acceleration, symmetrical in both directions (acceleration and deceleration).

The drive decelerates at this deceleration to the velocity = 0 when the function "Drive stop" is executed.

See also the functional description: "Drive Stop"

S-0-0138 - Attributes

Para. Name:	**DE**	Beschleunigung bipolar		
	EN	Bipolar acceleration limit value		
	FR	Accélération bipolaire		
	ES	Aceleracion bipolar		
	IT	Valore di Accellerazione Limite		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / S-0-0160/278		
Default value:		100000	**Cyc. transmittable:**	no

S-0-0139, D700 Command Parking axis

Setting and enabling the command Parking Axis switches off all the monitoring functions related to the measurement system.

This affects position control, feedback monitoring and the monitoring of the position window (S-0-0057).

When the command is active, the drive does not report any errors of class 1 diagnostics.

The Position feedback value status (S-0-0403) is cleared by the drive.

The command is acknowledged positive, when the mentionend surveillances are switched off.

Clearing the command switches all the mentioned surveillances on again. To refer the position feedback values to the reference point again, the drive must go to the reference again.

Structure of the parameter:

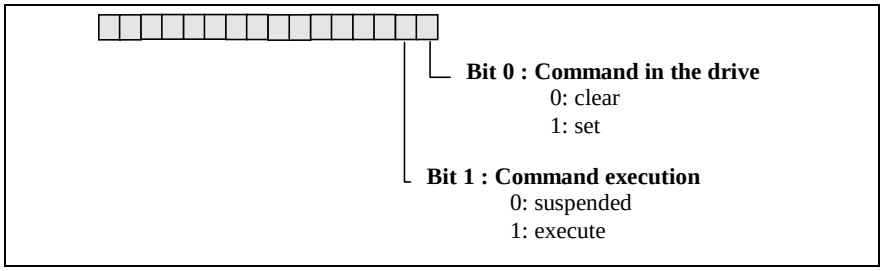

Fig. 2-1: S-0-0139, D700 Command Parking axis

See also the functional description: "Command Parking Axis".

S-0-0139 - Attributes

Para. Name:	**DE**	D700 Kommando Parkende Achse		
	EN	D700 Command Parking axis		
	FR	D700 Commande stationnement axe		
	ES	D700 Comando eje de estacionamiento		
	IT	D700 Comando Stazionamento Asse		
Function:		Command	**Editability:**	P2
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0140, Controller type

The device type of the manufacturer can be found in **text** form in the operating data for the controller type.

Examples:

HDS02.1-W100-D

DKC01.1-040-7

See also the functional description: "Drive Controllers".

S-0-0140 - Attributes

Para. Name:	**DE**	Regelgerätetyp		
	EN	Controller type		
	FR	Type de variateur		
	ES	Tipo de regulador		
	IT	Tipo Azionamento		
Function:		Parameter	**Editability:**	no
Data length:		1Byte variabel	**Memory:**	Verst. EE
Format:		ASCII	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0141, Motor type

Here is the motor type of the connected motor in **text** form.

For MDD, MKD and MKE motors, this value is stored in the motor feedback and will be loaded from there when the drive is started for the first time.

Example:

MKD 071B-061-KP1-BN

MKE 096B-047-GG0-KN

See also the functional description: "Motors".

S-0-0141 - Attributes

Para. Name:	**DE**	Motortyp		
	EN	Motor type		
	FR	Type de moteur		
	ES	Tipo de motor		
	IT	Tipo Motore		
Function:		Parameter	**Editability:**	P23
Data length:		1Byte variabel	**Memory:**	Param. EE
Format:		ASCII	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		Default_Motor	**Cyc. transmittable:**	no

S-0-0142, Application type

A descriptive name text for the drive can be stored in this parameter (e.g., swivel axis). It has no functional significance.

See also the functional description: "Range of Uses"

S-0-0142 - Attributes

Para. Name:	**DE**	Anwendungsart		
	EN	Application type		
	FR	Type d'application		
	ES	Tipo de aplicacion		
	IT	Tipo applicazione		
Function:		Parameter	**Editability:**	P234
Data length:		1Byte variabel	**Memory:**	Param. EE
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		Default	**Cyc. transmittable:**	no

S-0-0143, System interface version

The version of the SERCOS interface specifications is found in the operating data.

Current valid settings:

V	V 01.01:	V 01.02:
SERCOS specification German 01.00:	SERCOS English specification	SERCOS update German/English
Version 5/90	Version 4/91	Version 9/91

Fig. 2-25: S-0-0143, Version of the SERCOS interface specification

See also the functional description: "Overview of SERCOS communication".

S-0-0143 - Attributes

Para. Name:	**DE**	Sercos Interface Version		
	EN	System interface version		
	FR	Version d'interface SERCOS		
	ES	Version de Interface Sercos		
	IT	Versione del Interfaccia Sercos		
Function:		Parameter	**Editability:**	no
Data length:		1Byte variabel	**Memory:**	no
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0144, Signal status word

With the help of the signal status word, real time signals can be transferred from the drive to the PLC.

To do so, the signal status word must be configured as cyclic data in the Drive Telegram.

The bits in the signal status word can be defined freely with the parameters

- **S-0-0026, Configuration list signal status word** and
- **S-0-0328, Config. list for signal status word, bit number**.

See also the functional description: "Configurable signal status word"

S-0-0144 - Attributes

Para. Name:	**DE**	Signal-Statuswort		
	EN	Signal status word		
	FR	Mot d'état de signal		
	ES	Estado señal		
	IT	Stato Segnali		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0147, Homing parameter

This parameter contains operating sequences for **S-0-0148, C6 Drive-controlled homing procedure command** in reference to the equipment, NC and drive installation.

Parameter structure:

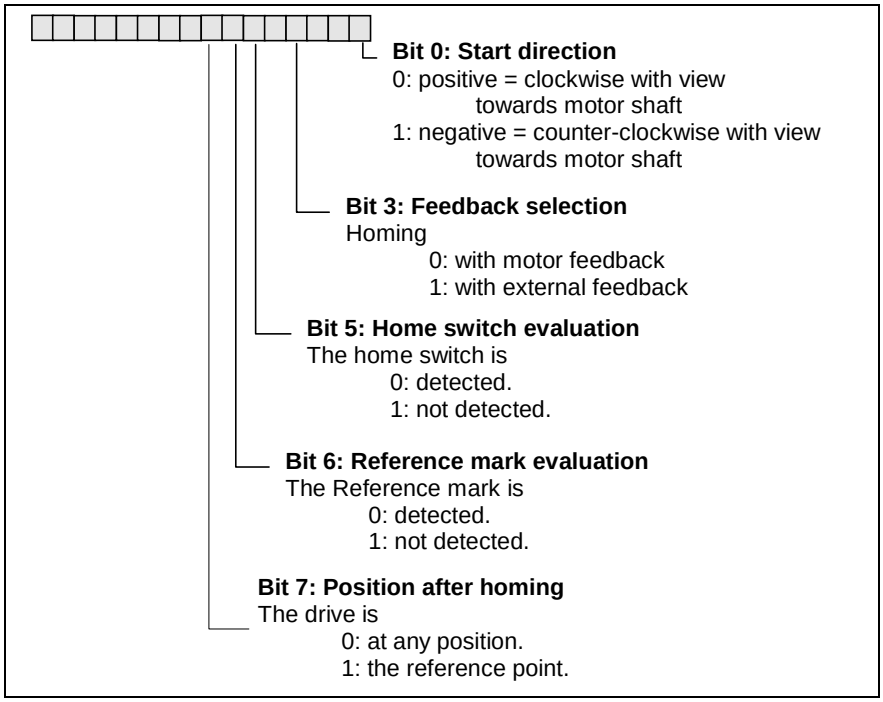
Bit 0: Start direction
0: positive = clockwise with view towards motor shaft
1: negative = counter-clockwise with view towards motor shaft
Bit 3: Feedback selection
Homing
0: with motor feedback
1: with external feedback
Bit 5: Home switch evaluation
The home switch is
0: detected.
1: not detected.
Bit 6: Reference mark evaluation
The Reference mark is
0: detected.
1: not detected.
Bit 7: Position after homing
The drive is
0: at any position.
1: the reference point.

Fig. 2-26: S-0-0147, Homing parameter

Note: Only the bits indicated here are supported by the software. In addition, bit 5 activates the monitoring of the external 24V.

See also the functional description: "Drive-controlled homing"

S-0-0147 - Attributes

Para. Name:	**DE**	Referenzfahr-Parameter		
	EN	Homing parameter		
	FR	Paramètre d'origine		
	ES	Parametro de puesta a cero		
	IT	Parametri Azzeramento		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0010 0000b	**Cyc. transmittable:**	no

S-0-0148, C600 Drive controlled homing procedure command

When this command is set and enabled, the drive switches automatically into internal position control and accelerates using the **S-0-0042, Homing acceleration** to the **Homing velocity, S-0-0042** as long as it is in operating status AF. Bit 0 in **S-0-0403, Position feedback value status** will be deleted at first. As long as the command is active, changes in the cyclic position command values will be ignored.

The process for the homing procedure can be specified with **S-0-0147, Homing parameter**. After the command has been properly executed (drive is at standstill and position feedback value is related to the homing position), the drive sets bit 0 = 1 in parameter **S-0-0403, Position feedback value status**.

The parameter „Position feedback value status“ reflects the signal „In_Reference“.

See also the functional description: "Drive-controlled homing"

S-0-0148 - Attributes

Para. Name:	**DE**	C600 Kommando Antriebsgeführtes Referenzieren		
	EN	C600 Drive controlled homing procedure command		
	FR	C600 Commande prise origine pilotée par entraînement		
	ES	C600 Comando puesta a cero por accionamiento		
	IT	C600 Asse controllato durante la Procedura di Azzer.		
Function:		Command	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0149, D400 Positive stop drive procedure command

When this command is set and enabled, all controller monitoring which would otherwise result in an class 1 diagnostic error message when the drive is blocked by a positive stop will be turned off.

Parameter structure:

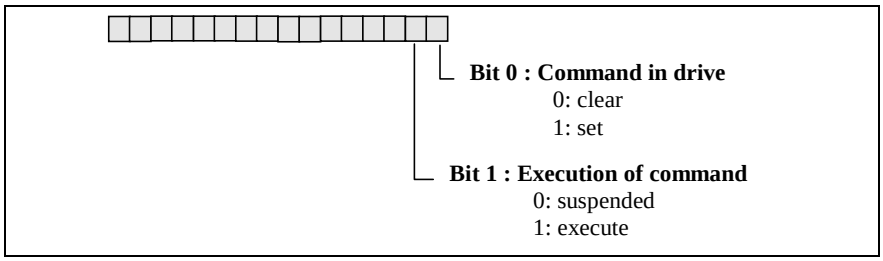

Fig. 2-27: S-0-0149, D400 Positive stop drive procedure command

See also the functional description: "Positive stop drive procedure".

S-0-0149 - Attributes

Para. Name:	**DE**	D400 Kommando Fahren auf Festanschlag		
	EN	D400 Positive stop drive procedure command		
	FR	D400 Commande déplacement contre obstacle fixe		
	ES	D400 Comando Desplazamiento a tope		
	IT	D400 Comando Movimento contro un Ostacolo fisso		
Function:		Command	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0150, Reference offset 1

This parameter describes the distance between the position encoder home reference marker 1 and **S-0-0052, Reference distance 1**.

The parameter makes it possible to shift the reference point in relation to the reference marker to be detected. If bit 7 in **S-0-0147, Homing parameter** is set to 1, then, during execution of the command **S-0-0148, C600 Drive controlled homing procedure command**, the drive goes to the reference point shifted from the reference mark by the value S-0-0150, Reference Offset 1.

See also the functional description: "Drive-controlled homing".

S-0-0150 - Attributes

Para. Name:	**DE**	Referenzmaß Offset 1		
	EN	Reference offset 1		
	FR	Décalage d'origine 1		
	ES	Medicion de referencia offset 1		
	IT	Azzeramento Offset 1 (Feedback Motore)		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0151, Reference offset 2

This parameter describes the distance between the position encoder home reference marker 2 and **S-0-0054, Reference distance 2**.

The parameter makes it possible to shift the reference point in relation to the reference marker to be detected. If bit 7 in **S-0-0147, Homing parameter** is set to 1, then, during execution of the command **S-0-0148, C600 Drive controlled homing procedure command**, the drive goes to the reference point shifted from the reference mark by the value **S-0-0151, Reference offset 2**.

See also the functional description: "Drive-controlled homing"

S-0-0151 - Attributes

Para. Name:	**DE**	Referenzmaß Offset 2		
	EN	Reference offset 2		
	FR	Décalage d'origine 2		
	ES	Medicion de referencia offset 2		
	IT	Azzeramento Offset 2 (Feedback esterno)		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0155, Friction compensation

The friction compensation is added into the torque/force command value. The sign (+/-) of the compensation value is determined by the sign of the velocity command value. The only way to change the sign is outside of what has been set in **S-0-0124, Standstill window.**

By programming the friction compensation, it is possible to compensate for static friction during acceleration from standstill and change of direction.

See also the functional description: "Setting the Frictional Torque Compensation".

S-0-0155 - Attributes

Para. Name:	**DE**	Reibungs-Kompensation		
	EN	Friction compensation		
	FR	Compensation de frottement		
	ES	Compensación de rozamiento		
	IT	Compensazione per Frizzione		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		%	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / S-0-0109/110		
Default value:		0	**Cyc. transmittable:**	no

S-0-0157, Velocity window

The Velocity window refers to the absolute value of the **S-0-0036, Velocity Command Value**.

If the velocity command value is whithin the calculated velocity window, then the drive sets the bit 0 in **S-0-0013, Class 3 diagnostics** (Message 'n_actual = n_command').

See also the functional description: "S-0-0013, Class 3 Diagnostics"

S-0-0157 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Fenster		
	EN	Velocity window		
	FR	Fenêtre de vitesse		
	ES	Ventana de velocidad		
	IT	Finestra Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Prog.-Modul
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0044		
Default value:		1000000	**Cyc. transmittable:**	no

S-0-0159, Monitoring window

When an operating mode with internal position control is activated in the drive, the position loop is monitored. Therefore, a **model value for the actual position** is calculated and compared with the real actual position.

The maximum tolerated deviation between the measured and calculated actual feedback value is set with the help of the parameter S-0-0159, Monitoring window. If the position deviation exceeds the monitoring window, then the drive sets the error **F228 Excessive deviation** in the class 1 diagnostics.

The greatest deviation that occurs will always be stored in parameter **P-0-0098, Max. model deviation**.

See also the functional description: "Position Control Loop Monitoring"

S-0-0159 - Attributes

Para. Name:	**DE**	Überwachungsfenster		
	EN	Monitoring window		
	FR	Fenêtre de contrôle		
	ES	Ventana de control		
	IT	Finestra di Monitoraggio		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		1000000	**Cyc. transmittable:**	no

S-0-0160, Acceleration data scaling type

Various scaling types can be set for the acceleration data in the drive, as described below.

Parameter structure:

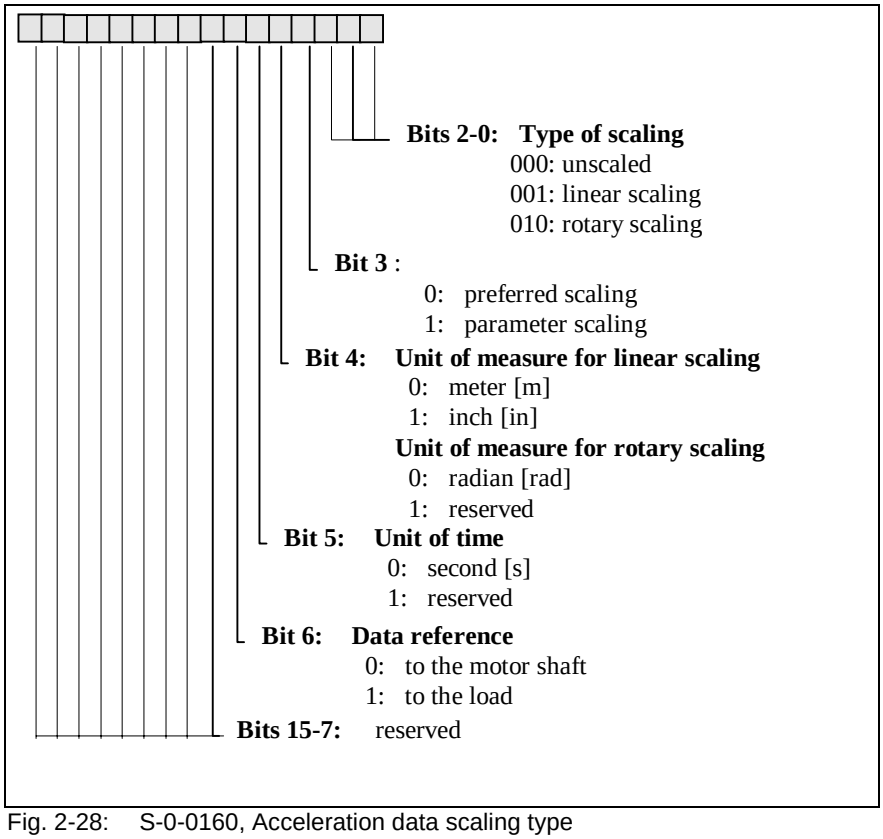

Fig. 2-28: S-0-0160, Acceleration data scaling type

Note: Only the bits indicated here are supported by the software.

See also the functional description: "Acceleration Data Display Format".

S-0-0160 - Attributes

Para. Name:	**DE**	Wichtungsart für Beschleunigungsdaten		
	EN	Acceleration data scaling type		
	FR	Type de calibrage pour données d'accélération		
	ES	Tipo de escala para datos de aceleracion		
	IT	Tipo di Scala per Dati Accellerazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0100 0010b	**Cyc. transmittable:**	no

S-0-0161, Acceleration data scaling factor

When parameter scaling is set in **S-0-0160, Acceleration data scaling type**, the scaling factor for all of the acceleration data in the drive is determined by this parameter.

See also the functional description: "Acceleration Data Display Format".

S-0-0161 - Attributes

Para. Name:	**DE**	Wichtungs-Faktor für Beschleunigungsdaten		
	EN	Acceleration data scaling factor		
	FR	Facteur de calibrage pour données d'accélération		
	ES	Factor de escala para datos de aceleracion		
	IT	Fattore di Scala per Dati Accellerazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 65535		
Default value:		1	**Cyc. transmittable:**	no

S-0-0162, Acceleration data scaling exponent

When parameter scaling is set in **S-0-0160, Acceleration data scaling type**, the scaling exponent for all of the acceleration data in the drive is determined by this parameter.

See also the functional description: "Acceleration Data Display Format".

S-0-0162 - Attributes

Para. Name:	**DE**	Wichtungs-Exponent für Beschleunigungsdaten		
	EN	Acceleration data scaling exponent		
	FR	Exposant de calibrage pour données d'accélération		
	ES	Exponente de escala para datos de aceleracion		
	IT	Esponente per Dati Accellerazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-32768 / 32768		
Default value:		-3	**Cyc. transmittable:**	no

S-0-0165, Distance coded reference offset 1

With the help of this parameter, the **greater distance** between two reference markers is programmed, if a measurement system with **distance coded reference markers** is used.

See also the functional description: "Drive-Controlled Homing"

S-0-0165 - Attributes

Para. Name:	**DE**	Abstandskodiertes Referenzmaß 1		
	EN	Distance coded reference offset 1		
	FR	Marques de référence de distance codée 1		
	ES	Marcas de referencia de distancia codificada 1		
	IT			
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Periods	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 4294967295		
Default value:		1001	**Cyc. transmittable:**	no

S-0-0166, Distance coded reference offset 2

With the help of this parameter, the **smaller distance** between two reference markers is programmed, if a measurement system with **distance coded reference markers** is used.

See also the functional description: "Drive-Controlled Homing"

S-0-0166 - Attributes

Para. Name:	**DE**	Abstandskodiertes Referenzmaß 2		
	EN	Distance coded reference offset 2		
	FR	Marques de référence de distance codée 2		
	ES	Marcas de referencia de distancia codificada 2		
	IT			
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Periods	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 4294967295		
Default value:		1000	**Cyc. transmittable:**	no

S-0-0169, Probe control parameter

This parameter is used to specify whether one or both of the probe inputs "probe 1" (DSS: X12-E4) and "probe 2" (DSS: X12-E5) are activated, and which edge (positive/negative) should trigger the probe data acquisition.

Parameter structure:

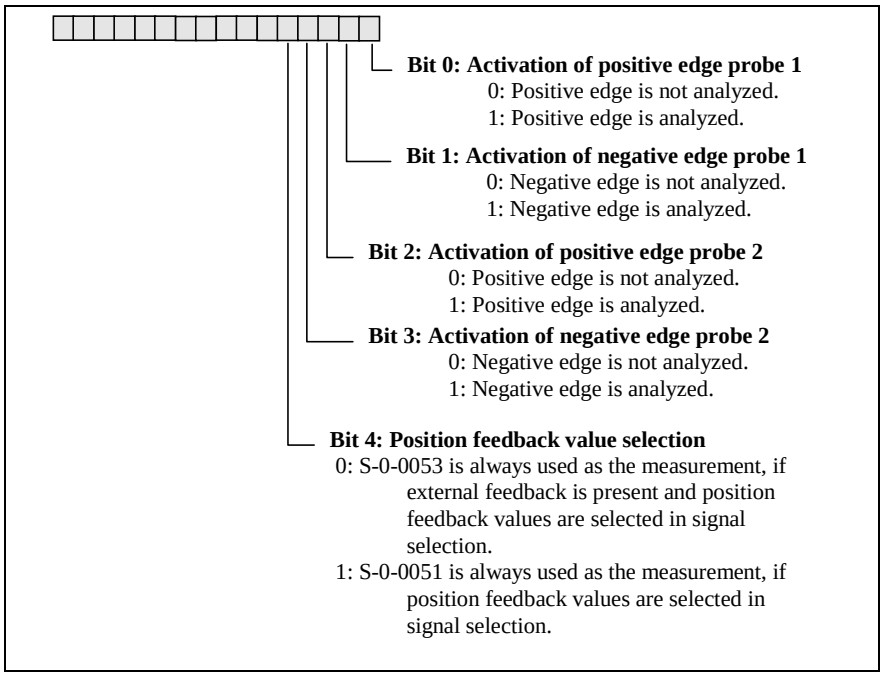
Bit 0: Activation of positive edge probe 1
0: Positive edge is not analyzed.
1: Positive edge is analyzed.
Bit 1: Activation of negative edge probe 1
0: Negative edge is not analyzed.
1: Negative edge is analyzed.
Bit 2: Activation of positive edge probe 2
0: Positive edge is not analyzed.
1: Positive edge is analyzed.
Bit 3: Activation of negative edge probe 2
0: Negative edge is not analyzed.
1: Negative edge is analyzed.
Bit 4: Position feedback value selection
0: S-0-0053 is always used as the measurement, if external feedback is present and position feedback values are selected in signal selection.
1: S-0-0051 is always used as the measurement, if position feedback values are selected in signal selection.

Fig. 2-29: S-0-0169, Probe control parameter

Note: Only the bits indicated here are supported by the software.

See also the functional description: "Probe Input Feature".

S-0-0169 - Attributes

Para. Name:	**DE**	Messtaster-Steuerparameter		
	EN	Probe control parameter		
	FR	Paramètre de commande de la sonde		
	ES	Parametros de mando de control de muestra		
	IT	Parametro di Controllo Probe		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0170, Probing cycle procedure command

By setting and enabling the command "probing cycle procedure," the drive reacts to the following:

- **S-0-0405, Probe 1 enable / S-0-0406, Probe 2 enable** and
- **S-0-0401, Probe 1, / S-0-0402, Probe 2.**

as is programmed in **S-0-0169, Probe control parameter**.

The NC can perform multiple measurements while this command is active. If the NC no longer wants new measurements, it clears the command.

Parameter structure:

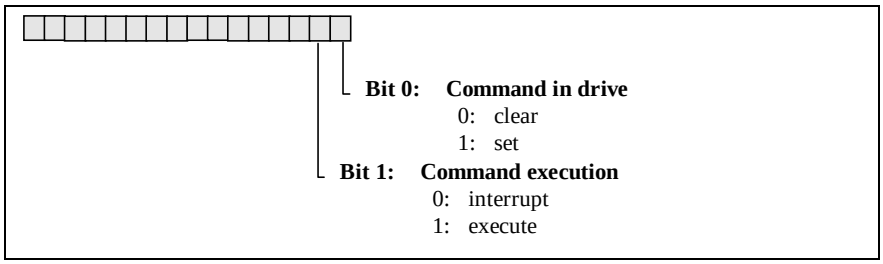

Fig. 2-30: S-0-0170, Probing cycle procedure command

Note: Only the bits indicated here are supported by the software.

See also the functional description: "Probe Input Feature".

S-0-0170 - Attributes

Para. Name:	**DE**	Kommando Messtasterzyklus		
	EN	Probing cycle procedure command		
	FR	Commande cycle mesure de sonde		
	ES	Comando ciclo de teclas de medicion		
	IT	Comando per Procedura di Probe		
Function:		Parameter	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0173, Marker position A

During the **drive controlled homing** with an incremental measuring system, the **position of the reference marker (zero pulse)** is stored in this parameter. This position feedback value still refers to the „old“ coordinate system (before switching the coordinate system with the homing procedure).

Furthermore, the recognition of the reference mark can be activated by the command **P-0-0014, D500 Command determine marker position**. Then, as soon as the next reference pulse comes from the feedback, the appropriate position value is stored in this parameter, and the command gets a positive acknowledge.

See also the functional description: "Command - detect marker position"

S-0-0173 - Attributes

Para. Name:	**DE**	Markerposition A		
	EN	Marker position A		
	FR	Position du marqueur A		
	ES	Posición de marcador A		
	IT	Posizione Marca A		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0177, Absolute distance 1

The parameter is used for the **homing** procedure **of a distance coded motor feedback**. It describes the offset between the zero point of the motor feedback (position of the 1st reference marker of the motor encoder) and the machine's zero-point.

Determining the right value for this parameter can be done in 2 steps. First, write the value 0 into S-0-0177 and proceed the command **S-0-0148, C600 Drive controlled homing procedure command**. The position feedback value 1 in S-0-0051 then shows the actual position refered to the machine’s zero point.

Then, when you jog the axis to the machine’s zero point, input the value of S-0-0051 indicated there into S-0-0177 with inverted sign (+ ↔ -). After another homing, the value in S-0-0051 displays the position in reference to the machine’s zero point.

See also the functional description: "Drive-Controlled Homing"

S-0-0177 - Attributes

Para. Name:	**DE**	Absolutmaß-Offset 1		
	EN	Absolute distance 1		
	FR	Décalage absolu 1		
	ES	Distancia absoluta 1		
	IT	Offset 1 per Dimensionamenti assoluti (Feedback Motore)		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0178, Absolute distance 2

The parameter is used for the **homing** procedure **of a distance coded external feedback**. It describes the offset between the zero point of the external feedback (position of the 1st reference marker) and the machine's zero-point.

Determining the right value for this parameter can be done in 2 steps. First, write the value 0 into S-0-0178 and proceed the command **S-0-0148, C600 Drive controlled homing procedure command**. The position feedback value 2 in S-0-0053 then shows the actual position refered to the machine’s zero point.

Then, when you jog the axis to the machine’s zero point, input the value of S-0-0053 indicated there into S-0-0178 with inverted sign (+ ↔ -). After another homing, the value in S-0-0053 displays the position in reference to the machine’s zero point.

See also the functional description: "Drive-Controlled Homing"

S-0-0178 - Attributes

Para. Name:	**DE**	Absolutmaß-Offset 2		
	EN	Absolute distance 2		
	FR	Décalage absolu 2		
	ES	Distancia absoluta 2		
	IT	Offset 2 per Dimensionamenti assoluti (Feedback esterno)		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0182, Manufacturer class 3 diagnostics

Various messages regarding the operating status are stored here every 8ms. If the status of a message changes, this will not be signaled by a change bit.

Parameter structure:

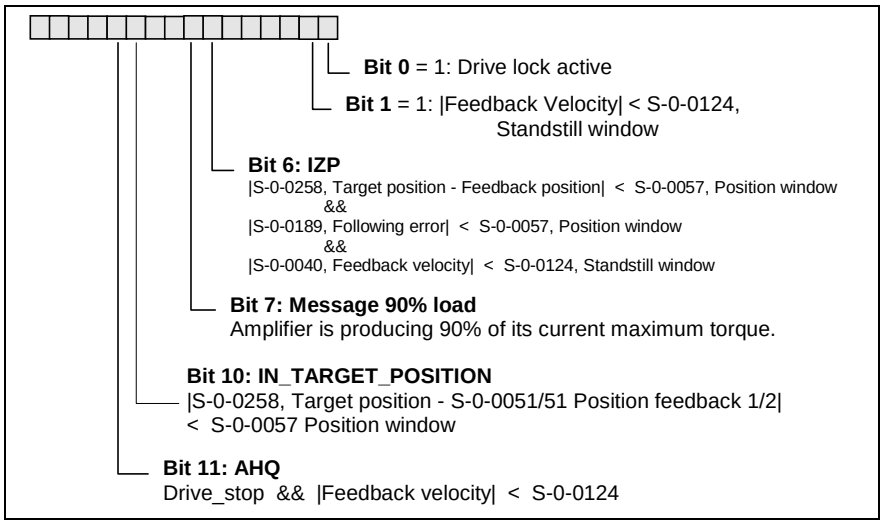
Bit 0 = 1: Drive lock active
Bit 1 = 1: |Feedback Velocity| < S-0-0124, Standstill window
Bit 6: IZP
|S-0-0258, Target position - Feedback position| < S-0-0057, Position window
&&
|S-0-0189, Following error| < S-0-0057, Position window
&&
|S-0-0040, Feedback velocity| < S-0-0124, Standstill window
Bit 7: Message 90% load
Amplifier is producing 90% of its current maximum torque.
Bit 10: IN_TARGET_POSITION
|S-0-0258, Target position - S-0-0051/51 Position feedback 1/2| < S-0-0057 Position window
Bit 11: AHQ
Drive_stop && |Feedback velocity| < S-0-0124

Fig. 2-31: S-0-0182, Manufacturer class 3 diagnostics

Note: Only the bits indicated here are supported by the software.

See also the functional description: "S-0-0182, Manufacturer Class 3 Diagnostics".

S-0-0182 - Attributes

Para. Name:	**DE**	Hersteller-Zustandsklasse 3		
	EN	Manufacturer class 3 diagnostics		
	FR	Diagnostic de classe 3 spéc. au fabriquant		
	ES	Diagnostico fabricante clase 3		
	IT	Diagnostica Classe 3 definita dal Costruttore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0185, Length of the configurable data record in the AT

In the operating data of the parameter with this ID number, the drive indicates the maximum length in bytes which it can process in the configurable data record of the drive telegram (AT).

Note: In the actual version of the firmware, the number of data in the AT equals 24 bytes.

See also the functional description: "Configuration of telegram contents".

S-0-0185 - Attributes

Para. Name:	**DE**	Länge des konfigurierbaren Datensatzes im AT		
	EN	Length of the configurable data record in the AT		
	FR	Longueur du registre de données configurables dans l'AT		
	ES	Longitud del bloque de datos configurable en el AT		
	IT	Lunghezza del Registro Dati in AT		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0186, Length of the configurable data record in the MDT

In the operating data of the parameter with this ID number, the drive indicates the maximum length in bytes which it can process in the configurable data record of the Master Data Telegram.

Note: In the actual version of the firmware, the number of data in the MDT equals 32 bytes.

See also the functional description: "Configuration of telegram contents".

S-0-0186 - Attributes

Para. Name:	**DE**	Länge des konfig. Datensatzes im MDT		
	EN	Length of the configurable data record in the MDT		
	FR	Longueur du registre de données configurables dans le MDT		
	ES	Longitud del bloque de datos configurable en el MDT		
	IT	Lunghezza del Registro Dati in MDT		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0187, List of configurable data in the AT

This list contains the ID numbers of the operating data which can be configured in the drive telegram (AT).

- **S-0-0040, Velocity feedback value**
- **S-0-0051, Position feedback value 1 (motor feedback)**
- **S-0-0053, Position feedback value 2 (ext. feedback)**
- **S-0-0084, Torque/Force feedback value**
- **S-0-0130, Probe value 1 positive edge**
- **S-0-0131, Probe value 1 negative edge**
- **S-0-0132, Probe value 2 positive edge**
- **S-0-0133, Probe value 2 negative edge**
- **S-0-0182, Manufacturer class 3 diagnostics**
- **S-0-0189, Following error**
- **P-0-0082, Parallel I/O input 1**
- **P-0-0111, Parallel I/O input 2**
- **P-0-0113, Parallel I/O input 3**
- **P-0-0171, Parallel I/O input 4**
- **P-0-0173, Parallel I/O input 5**
- **P-0-0175, Parallel I/O input 6**
- **P-0-0202, Difference probe values 1**
- **P-0-0203, Difference probe values 2**
- **P-0-0210, Analog input 1**
- **P-0-0211, Analog input 2**

See also the functional description: "Configuration of telegram contents".

S-0-0187 - Attributes

Para. Name:	**DE**	Liste der konfigurierbaren Daten im AT		
	EN	List of configurable data in the AT		
	FR	Liste des IDN de données configurables dans l'AT		
	ES	Lista de los datos configurables en el AT		
	IT	Lista dei Dati configurabili in AT		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0188, List of configurable data in the MDT

This list contains the ID numbers of the operating data which can be configured in the Master Data Telegram.

- **S-0-0036, Velocity command value**
- **S-0-0037, Additive velocity command value**
- **S-0-0047, Position command value**
- **S-0-0080, Torque/force command**
- **S-0-0091, Bipolar velocity limit value**
- **S-0-0092, Bipolar torque/force limit value**
- **S-0-0138, Bipolar acceleration limit value**
- **S-0-0193, Positioning Jerk**
- **S-0-0258, Target position**
- **S-0-0259, Positioning Velocity**
- **S-0-0260, Positioning Acceleration**
- **S-0-0349, Jerk limit bipolar**
- **P-0-0081, Parallel I/O output 1**
- **P-0-0110, Parallel I/O output 2**
- **P-0-0112, Parallel I/O output 3**
- **P-0-0170, Parallel I/O output 4**
- **P-0-0172, Parallel I/O output 5**
- **P-0-0174, Parallel I/O output 6**
- **P-0-0400, Pos. corr., external correction value**
- **P-0-0405, Pos. corr., actual temperature, position independent**

See also the functional description: "Configuration of telegram contents".

S-0-0188 - Attributes

Para. Name:	**DE**	Liste der konfigurierbaren Daten im MDT		
	EN	List of configurable data in the MDT		
	FR	Liste des IDN de données configurables dans le MDT		
	ES	Lista de los datos configurables en el MDT		
	IT	Lista dei Dati configurabili in MDT		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0189, Following error

To this parameter, the drive writes the current **difference between the position command and the feedback position** value (**S-0-0051, Position feedback value 1** or **S-0-0053, Position feedback value 2**).

See also the functional description: "Determining the position controller setting" and **P-0-0098, Max. model deviation**.

S-0-0189 - Attributes

Para. Name:	**DE**	Schleppabstand		
	EN	Following error		
	FR	Ecart de poursuite		
	ES	Error de seguimiento		
	IT	Errore di Inseguimento		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

S-0-0191, D600 Cancel reference point procedure command

Setting and enabling the command Cancel reference point clears the bit **S-0-0403, Position feedback value status** in the drive.

The command correctly completed in the drive, when the bit „Position feedback value status“ has been set to 0 and the position value of the active feedback does not refer any more to the machine’s zero point (= **no longer referenced**).

Parameter structure:

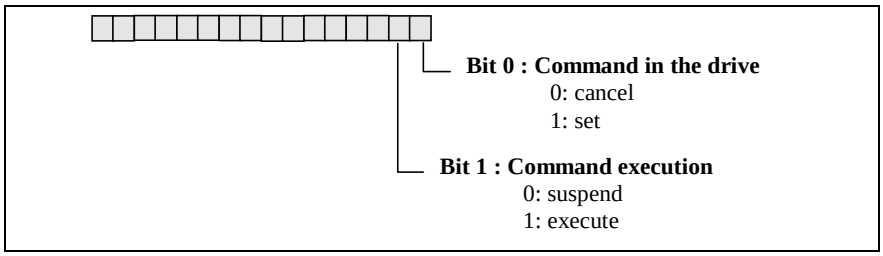

Fig. 2-32: S-0-0191, D600 Cancel reference point procedure command

See also the functional description: "Drive-Controlled Homing"

S-0-0191 - Attributes

Para. Name:	**DE**	D600 Kommando Referenzbezug löschen		
	EN	D600 Cancel reference point procedure command		
	FR	D600 Commande Annullation de l'origine		
	ES	D600 Comando Borrar referencia		
	IT	D600 Comando Anullazione Azzeramento		
Function:		Command	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0192, IDN-list of backup operation data

The ID numbers for all operating data that must be loaded in the drive for proper operation are kept in the IDN list. Generally these are the parameters which are buffered in the programming module.

The control system uses this IDN list to create a backup copy of the drive parameters.

If a customer password has been activated with the parameter **S-0-0267, Password**, all parameters contained in S-0-0192, IDN List of backup operation data are write protectednd.

See also the functional description: "Parameters Stored in DSM Programming Module".

S-0-0192 - Attributes

Para. Name:	**DE**	IDN-Liste der zu sichernden Betriebsdaten		
	EN	IDN-list of backup operation data		
	FR	Liste des IDN des données d'exploitation de sauvegarde		
	ES	Lista IDN de los datos de servicio de seguridad		
	IT	IDN-Lista dei Operativi salvati		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0193, Positioning Jerk

The positioning jerk limits the **acceleration change per time** in the operating modes with

- Drive internal interpolation and
- Relative drive internal interpolation.

Note: With the value 0, the jerk filter is off.

See also the functional description: "Generator Function: Drive Internal Interpolation".

S-0-0193 - Attributes

Para. Name:	**DE**	Positionier-Ruck		
	EN	Positioning Jerk		
	FR	Jerk de positionnement		
	ES	Posicionamiento agitacion		
	IT	Jerk per Posizionamento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / 4000000.000		
Default value:		0	**Cyc. transmittable:**	MDT

S-0-0201, Motor warning temperature

If the motor temperature exceeds the motor warning temperature, then the motor warning high temperature bit will be set by the drive in **S-0-0012, Class 2 diagnostics**.

This parameter will be set by the drive at 145° for MDD, MKD and MKE motors.

See also the functional description: "Temperature monitoring".

S-0-0201 - Attributes

Para. Name:	**DE**	Motor-Warntemperatur		
	EN	Motor warning temperature		
	FR	Température de préalerte du moteur		
	ES	Temperatura de aviso de motor		
	IT	Preallarme Temperatura Motore		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		C	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		45.0 / S-0-0204		
Default value:		1400	**Cyc. transmittable:**	no

S-0-0204, Motor shutdown temperature

If the motor temperature exceeds the motor shutdown temperature, then the motor overtemperature bit in **S-0-0011, Class 1 diagnostics** will be set by the drive and the error **F219 Motor overtemp. shutdown** will be generated.

In MDD, MKD and MKE motors, the drive sets this parameter at 155°.

See also the functional description: "Temperature monitoring".

S-0-0204 - Attributes

Para. Name:	**DE**	Motor-Abschalttemperatur		
	EN	Motor shutdown temperature		
	FR	Température d'arrêt du moteur		
	ES	Temperatura de desconexion de motor		
	IT	Spegnimento per Sovratemp. Motore		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		C	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		S-0-0201 / 155.0		
Default value:		1500	**Cyc. transmittable:**	no

S-0-0256, Multiplication 1

The parameter S-0-0256, Multiplication 1 determines, with which factor the signals of the motor feedback are multiplied in the drive.

The internal **resolution** for the motor encoder in the drive is calculated as follows:

S-0-0116 Resolution of motor feedback • S-0-0256 Multiplication 1

The multiplication 1 depends at first from the parameters **S-0-0278, Maximum travel range** and **S-0-0116, Resolution of motor feedback**. If there is an external encoder, the **S-0-0257, Multiplication 2** is taken into account as well.

See also the functional description: "Setting the drive-internal position data format"

S-0-0256 - Attributes

Para. Name:	**DE**	Vervielfachung 1		
	EN	Multiplication 1		
	FR	Multiplication 1		
	ES	Multiplicación 1		
	IT	Multiplicazione 1		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0257, Multiplication 2

The parameter S-0-0257, Multiplication 2 determines, with which factor the signals of the external feedback are multiplied in the drive.

The internal **resolution** for the external encoder in the drive is calculated as follows:

S-0-0117 Resolution of external feedback • S-0-0257 Multiplication 2

The multiplication 2 depends on the parameters **S-0-0278, Maximum travel range** and **S-0-0117, Resolution of external feedback**.

See also the functional description: "Setting the drive-internal position data format"

S-0-0257 - Attributes

Para. Name:	**DE**	Vervielfachung 2		
	EN	Multiplication 2		
	FR	Multiplication 2		
	ES	Multiplicación 2		
	IT	Multiplicazione 2		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0258, Target position

The target position is assigned to the drive as a command value by the controller in the operating modes with **drive-controlled interpolation**. The drive moves to the target position taking into account the following values:

- **S-0-0259, Positioning Velocity**
- **S-0-0260, Positioning Acceleration**
- **S-0-0193, Positioning Jerk**

In the operating mode "Position control with positioning interface" (process blocks), the target position of the current position block will be copied to parameter S-0-0258, target position.

See also the functional description: "Generator Function: Drive Internal Interpolation"

S-0-0258 - Attributes

Para. Name:	**DE**	Zielposition		
	EN	Target position		
	FR	Position à atteindre		
	ES	Posicion objeto		
	IT	Posizione da raggiungere		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0259, Positioning Velocity

The Positioning Velocity is used in the operating mode "**Drive-controlled interpolation**" to reach the **S-0-0258, Target position**.

See also the functional description: "Generator Function: Drive Internal Interpolation".

S-0-0259 - Attributes

Para. Name:	**DE**	Positionier-Geschwindigkeit		
	EN	Positioning Velocity		
	FR	Vitesse de positionnement		
	ES	Velocidad de posicionamiento		
	IT	Velocità di Posizionameneto		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / S-0-0044		
Default value:		100000	**Cyc. transmittable:**	MDT

S-0-0260, Positioning Acceleration

The Positioning acceleration is used in the operating mode "**Drive-controlled interpolation**" to accelerate to the **S-0-0259, Positioning Velocity**.

See also the functional description: "Generator Function: Drive Internal Interpolation".

S-0-0260 - Attributes

Para. Name:	**DE**	Positionier-Beschleunigung		
	EN	Positioning Acceleration		
	FR	Accélération de positionnement		
	ES	Aceleracion de posicionamiento		
	IT	Accellerazione per Posizionamento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / S-0-0160/278		
Default value:		100000	**Cyc. transmittable:**	MDT

S-0-0262, C700 Command basic load

When this command is set and enabled, the default parameters in the motor feedback for current, velocity and position **control loop settings** will be loaded and activated. These default parameters are **not** optimized for the specific application. They establish a stable control loop status.

ATTENTION

⇒ When this command is executed, parameters that have already been optimized may be overwritten.

See also Function description: "Load Default Feature"

S-0-0262 - Attributes

Para. Name:	**DE**	C700 Kommando Urladen		
	EN	C700 Command basic load		
	FR	C700 Commande chargement initial		
	ES	C700 Comando carga base		
	IT	C700 Comando Caricamento Base		
Function:		Command	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0265, Language selection

All parameter names, units and diagnostic warning messages within the drive controller are stored in several languages. This parameter determines the output language for the text.

- 0: German
- 1: English
- 2: French
- 3: Spanish
- 4: Italian

See also the functional description: "Language selection".

S-0-0265 - Attributes

Para. Name:	**DE**	Sprach-Umschaltung		
	EN	Language selection		
	FR	Sélection de langue		
	ES	Cambio de idioma		
	IT	Selezione di Lingua		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 4		
Default value:		0	**Cyc. transmittable:**	no

S-0-0267, Password

With this parameter, a customer password can be activated. This is used to lock the editability of all important parameters specific for the axis. The parameters which are locked by activating the customer password, can be seen in the parameter **S-0-0192, IDN-List of backup operation data**.

Moreover, the parameter can unlock service capabilities.

See also the functional description: "Password"

S-0-0267 - Attributes

Para. Name:	**DE**	Passwort		
	EN	Password		
	FR	Mot de passe		
	ES	Contraseña		
	IT	Parola Chiave		
Function:		Parameter	**Editability:**	P234
Data length:		1Byte	**Memory:**	no
Format:		ASCII	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0269, Parameter buffer mode

The Parameter buffer mode is used to determine whether the data transmitted through the service cannel (or serial interface) will be stored temporarily (in RAM) or permanently (in EEPROM).

1: Data will not be stored permanently. (Data are volatile.)

0: Data will be stored permanently. (Data are resident.)

After the control voltage supply has been switched on, the drive will initialize bit 0 to 0. To activate temporary storage mode, bit 0 must be forced to 1 after switching on.

Note: For applications that write cylic or frequent updates to buffered parameters: Parameter buffer mode = 1 (temporary) should be activated by the initialization procedure in the machine control. This mode ensures that the write cycle life of the EEPROM is not exceeded. Must be re-programmed after complete power shut down.

See also the functional description: "Parameters Stored in DSM Programming Module"

S-0-0269 - Attributes

Para. Name:	**DE**	Speicherungsmode		
	EN	Parameter buffer mode		
	FR	Mode d'enregistrement		
	ES	Modo de buffer		
	IT	Buffer Modo Parametri		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 1		
Default value:		---	**Cyc. transmittable:**	no

S-0-0277, Position feedback 1 type parameter

This parameter is used to determine the significant properties of the motor encoder (Position encoder 1).

Parameter structure:

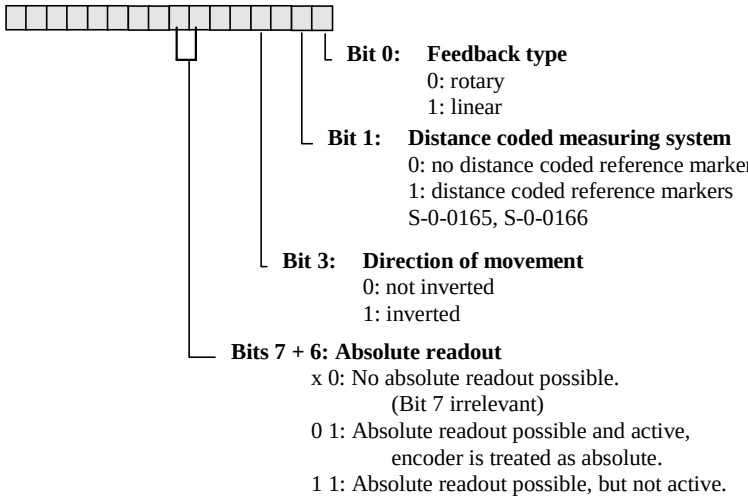
Bit 0: Feedback type
0: rotary
1: linear
Bit 1: Distance coded measuring system
0: no distance coded reference markers
1: distance coded reference markers
S-0-0165, S-0-0166
Bit 3: Direction of movement
0: not inverted
1: inverted
Bits 7 + 6: Absolute readout
x 0: No absolute readout possible.
(Bit 7 irrelevant)
0 1: Absolute readout possible and active,
encoder is treated as absolute.
1 1: Absolute readout possible, but not active.

Fig. 2-33: S-0-0277, Position feedback 1 type parameter

Remark:

For absolute measurement systems with data memory, bit 6 is set automatically.

When MDD-, MKD and MKE motors are used, bits 0, 1, and 3 are set and write-protected by the drive.

Note: Only the bits indicated here are supported by the software.

See also the functional description: "Other Motor Encoder Characteristics"

S-0-0277 - Attributes

Para. Name:	**DE**	Lagegeberart-Parameter 1		
	EN	Position feedback 1 type parameter		
	FR	Paramètre type codeur 1		
	ES	Parametro de tipo de encoder de posicion 1		
	IT	Tipo Parametri Feedback Posizione 1		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

S-0-0278, Maximum travel range

The parameter S-0-0278, Maximum travel range defines the maximum possible mechanical move of the machine. Depending on the selected scaling, modulo or absolute format (see also **S-0-0076, Position data scaling type**), the input is unipolar (positive only) or bipolar (with sign).

The parameter S-0-0278, Maximum travel range affects the parameters **S-0-0256, Multiplication 1** and **S-0-0257, Multiplication 2** and therefore the internal position resolution in the drive.

Moreover, the limits for velocity and acceleration of the drive internal position command generator are influenced by the maximum travel range. Among others, the max. input values for **S-0-0259, Positioning Velocity** and **S-0-0260, Positioning Acceleration** depend from the value in S-0-0278 !

Note: The greater the parametrized maximum travel range, the smaller is the multiplication and the drive internal position resolution and the higher are the limits of the acceleration and velocity data.

Additionally, the parameter S-0-0278, Maximum travel range affects the bit 6 "Absolute readout possible“ in the respective **Position feedback type parameter (S-0-0277 or S-0-0115**). If the parametrized maximum travel range is greater than the absolute numerical range of the used encoder, then the bit 6 for "Absolute readout possible“ is reset to 0. Vice versa, the bit 6 is set as soon as a travel range less than the absolute numerical range of the encoder is recognized.

See also the functional description: "Setting the drive-internal position data format"

S-0-0278 - Attributes

Para. Name:	**DE**	Maximaler Verfahrbereich		
	EN	Maximum travel range		
	FR	Champs de déplacement maxi.		
	ES	Campo máximo de desplazamiento		
	IT	Campo di Movimento mass.		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / 214748.3647		
Default value:		2147483647	**Cyc. transmittable:**	no

S-0-0282, Travel distance

The control gives to the drive the travel distance in the operating mode **Relative internal Interpolation** as a **relative command value**.

When the parameter **S-0-0346, Setup flag for relative command values** is toggled (= changed), the drive adds the travel distance to the target position. The resulting absolute target position is displayed in in the parameter **S-0-0258, Target position**. Then, the drive performs the travel distance, with regard to

- **S-0-0259, Positioning Velocity**
- **S-0-0260, Positioning Acceleration**
- **S-0-0193, Positioning Jerk**

See also the functional description: "Relative drive-internal interpolation"

S-0-0282 - Attributes

Para. Name:	**DE**	Verfahrweg		
	EN	Travel distance		
	FR	Distance à parcourir		
	ES	Recorrido de desplazamiento		
	IT	Distanza movimento		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0292, List of all operation modes

In this list, all operation modes are named, which the drive supports. The operation modes are listed by their codings, as they are input in the parameters **S-0-0032..35** (primary and secondary operation modes).

See also the functional description: "Basic operating modes".

S-0-0292 - Attributes

Para. Name:	**DE**	Liste der unterstützten Betriebsarten		
	EN	List of all operation modes		
	FR	Liste de tous les mode d'opération		
	ES	Lista de todos los modos de operación		
	IT	Lista di tutti i Modi operativi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	constant
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-- / --		
Default value:		---	**Cyc. transmittable:**	no

S-0-0298, Reference cam shift by..

For the drive controlled homing, if there is more than one reference marker in the travel range of the axis during homing, it is necessary to evaluate a reference switch. In this case, the 0->1 rising edge of the zero switch specifies the relevant reference marker.

To do this, the distance between zero switch and reference marker may not be below a certain value, because otherwise the reference marker is ambiguous. Therefore, the drive monitors the distance. If the distance is outside the allowed range, the command **S-0-0148, C600 Drive controlled homing procedure command** ends up with the error **C602 Distance zero switch - reference marker wrong**.

In this case, this parameter shows the distance, by which the zero switch must be shifted, to get the optimal distance.

You can either

- input the value in the parameter **S-0-0299, Home switch offset** to shift the active zero switch (virtually) referred to the real one, or
- shift the zero switch mechanically by the value displayed in S-0-0298.

If the distance between zero switch and reference marker is good, then S-0-0298, Reference cam shift by.. displays a 0.

See also the functional description: "Drive-Controlled Homing"

S-0-0298 - Attributes

Para. Name:	**DE**	Verschiebung des Referenznockens um..
	EN	Reference cam shift by..
	FR	Décalage de la came d'origine de..
	ES	Desplazamiento de la leva de origen a..
	IT	

Function:	Parameter	**Editability:**	no
Data length:	4Byte	**Memory:**	no
Format:	DEC_MV	**Validity check:**	no
Unit:	S-0-0076	**Extrem value check:**	no
Decimal places:	4	**Combination check:**	no
Input min/max:	--- / ---		
Default value:	---	**Cyc. transmittable:**	no

S-0-0299, Home switch offset

For the drive controlled homing, if there is more than one reference marker in the travel range of the axis during homing, it is necessary to evaluate a reference switch. In this case, the 0->1 rising edge of the zero switch specifies the relevant reference marker.

To do this, the distance between zero switch and reference marker may not be below a certain value, because otherwise the reference marker is ambiguous. Therefore, the drive monitors the distance. If the distance is outside the allowed range, the command **S-0-0148, C600 Drive controlled homing procedure command** ends up with the error **C602 Distance zero switch - reference marker wrong**.

In this case, this parameter shows the distance, by which the zero switch must be shifted, to get the optimal distance.

You can either

- input the value in the parameter **S-0-0299, Home switch offset** to shift the active zero switch (virtually) referred to the real one, or
- shift the zero switch mechanically by the value displayed in S-0-0298.

If the distance between zero switch and reference marker is good, then S-0-0298, Reference cam shift by.. displays a 0.

See also the functional description: "Drive-Controlled Homing"

S-0-0299 - Attributes

Para. Name:	**DE**	Referenzschalter-Offset		
	EN	Home switch offset		
	FR	Décalage contact origine		
	ES	Offset de interruptor de referencia		
	IT	Offset FC di Zero		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0301, Allocation of real-time control Bit 1

In order to assign a signal to the real-time control bit 1, the ID number of the signal is written to the operating data of the assignment for the real-time control bit 1.

If such an assignment is made, the assigned signal (bit 0) will be controlled by the real-time control bit 1 (= component of the master control word).

If the selected IDN is not available, the drive responds with the service channel error message "IDN not available"

If the programmed IDN is available but is not editable in phase 4, then the drive responds with the error message "Data not correct"

See also the functional description: "Real-time control and status bits".

S-0-0301 - Attributes

Para. Name:	**DE**	Zuweisung Echtzeitsteuerbit 1		
	EN	Allocation of real-time control Bit 1		
	FR	Allocation bit contrôle temps réel 1		
	ES	Asignacion bit de mando tiempo real 1		
	IT	Allocazione del Real Time Control Bit 1		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

S-0-0303, Allocation of real-time control Bit 2

In order to assign a signal the real-time control bit 2, the ID number of the signal is written to the operating data of the assignment for the real-time control bit 2.

If such an assignment is made, the assigned signal (bit 0) will be controlled by the real-time control bit 2 (= component of the master control word).

See also the functional description: "Real-time control and status bits".

S-0-0303 - Attributes

Para. Name:	**DE**	Zuweisung Echtzeitsteuerbit 2		
	EN	Allocation of real-time control Bit 2		
	FR	Allocation bit contrôle temps réel 2		
	ES	Asignacion bit de mando tiempo real 2		
	IT	Allocazione del Real Time Control Bit 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

S-0-0305, Allocation of real-time status Bit 1

In order to assign a signal to the real-time status bit 1, the ID number of the signal is written to the operating data of the assignment for the real-time status bit 1.

If such an assignment is made, the assigned signal (bit 0) thereafter appears in the real-time status bit 1 (= component of the drive status word).

If the programmed IDN is not available, the drive responds with the service channel error message "IDN not available".

See also the functional description: "Real-time control and status bits".

S-0-0305 - Attributes

Para. Name:	**DE**	Zuweisung Echtzeitstatusbit 1		
	EN	Allocation of real-time status Bit 1		
	FR	Allocation bit état temps réel 1		
	ES	Asignacion bit de mando tiempo real 1		
	IT	Allocazione del Real Time Status Bit 1		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

S-0-0307, Allocation of real-time status Bit 2

In order to assign a signal to the real-time status bit 2, the ID number of the signal is written to the operating data of the assignment for the real-time status bit 2.

If such an assignment is made, the assigned signal (bit 0) thereafter appears in the real-time status bit 2 (component of the drive status word).

See also the functional description: "Real-time control and status bits".

S-0-0307 - Attributes

Para. Name:	**DE**	Zuweisung Echtzeitstatusbit 2		
	EN	Allocation of real-time status Bit 2		
	FR	Allocation bit état temps réel 2		
	ES	Asignacion bit de estado tiempo real 2		
	IT	Allocazione del Real Time Status Bit 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

S-0-0328, Config. list signal status word, bit number

The configuration of the signal status word (S-0-0144) is done with the parameters **S-0-0026, Configuration list signal status word** and **S-0-0328, Config. list signal status word, bit number**. These parameters have variable length with 16-bit data elements. The parameter **S-0-0026, Configuration list signal status** , bit number determines, which bit in the data is copied into the signal status word.

The position in the respective Configuration list determines, to which position in the signal status word the chosen bit is copied.

See also the functional description: "Configurable signal status word"

S-0-0328 - Attributes

Para. Name:	**DE**	Konfig.-Liste Signal-Statuswort, Bitnummer		
	EN	Config. list signal status word, bit number		
	FR	Liste de config. pour statut des signaux, numéro du bit		
	ES	Lista de config. Estado de señal, número de bit		
	IT	Lista di Config. per Stato Segnali, Numero di Bit		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte variabel	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		0	**Cyc. transmittable:**	no

S-0-0346, Setup flag for relative command values

When the operation mode **Relative drive-internal interpolation** is active, the drive performs the distance parametrized in **S-0-0282, Travel distance**, as soon as the bit 0 in S-0-0346, Setup flag for relative command values toggles (changes).

See also the functional description: "Relative drive-internal interpolation"

S-0-0346 - Attributes

Para. Name:	**DE**	Übernahme relative Sollwerte		
	EN	Setup flag for relative command values		
	FR	Drapeau pour changer la distance relative de la broche		
	ES	Indicador de ajuste para valores nominales relativos		
	IT	Indicatore per cambiare la Distanza Mandrino		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 1		
Default value:		---	**Cyc. transmittable:**	MDT

S-0-0347, Speed deviation

Parameter S-0-0347 indicates the difference between the velocity command value and the velocity feedback value in the velocity controller.

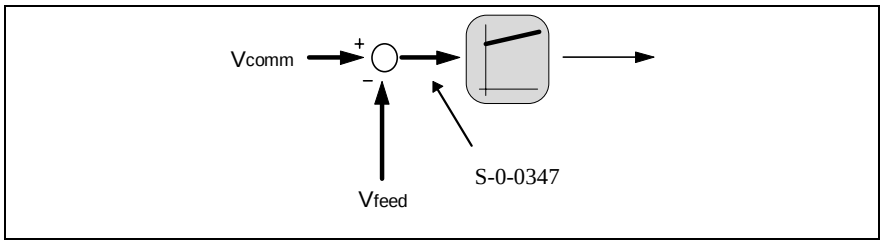

Fig. 2-34: S-0-0347, Speed deviation

See also the functional description: "Velocity controller".

S-0-0347 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Regelabweichung		
	EN	Speed deviation		
	FR	Ecart de vitesse		
	ES	Desviación de velocidad		
	IT	E.I. di Velocità		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0348, Acceleration feedforward prop. gain

The acceleration feedforward helps to reduce the following error during the acceleration phase in operating modes without following error. The current acceleration command value is multiplied by the "Proportional gain acceleration feed forward" and added to the current command value of the velocity controller.

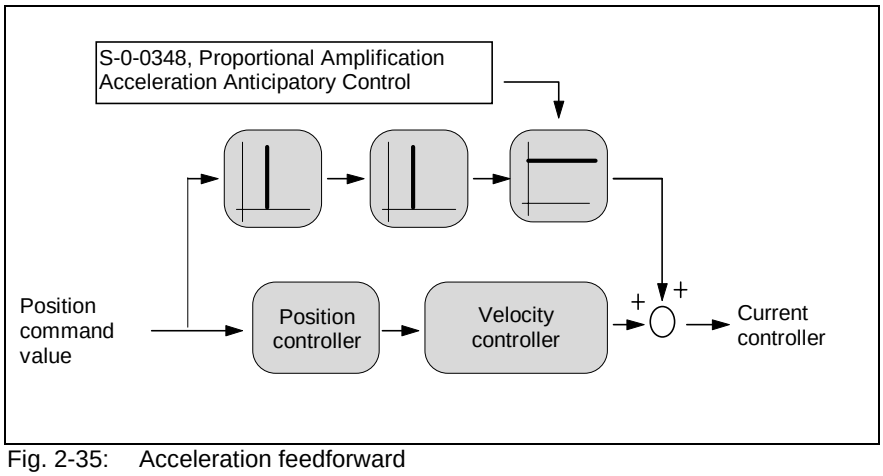

Fig. 2-35: Acceleration feedforward

Activation:

Writing a value greater than 0 to the parameter activates the acceleration feed forward.

Note: The acceleration feedforward is only possible in the operating modes without following error.

Correct input value:

$$K_R = (J_m + J_L) / K_m \; [\bullet 1000 \; mA/A]$$

where: K_R = proportional gain acceleration feed forward

J_m = moment of inertia of the rotor

J_L = reflected moment of inertia from the load

K_m = torque constant

See also the functional description: "Setting the acceleration feed forward".

S-0-0348 - Attributes

Para. Name:	**DE**	Proportionalverst. Beschleunigungsvorsteuerung		
	EN	Acceleration feedforward prop. gain		
	FR	Anticipation d'accélération, gain prop.		
	ES	Ajuste proporcional mando adelante de aceleracion		
	IT	Guadagno proporzionale Accellerazione		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		mA/(rad/s²)	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 6553.5		
Default value:		0	**Cyc. transmittable:**	no

S-0-0349, Jerk limit bipolar

The Jerk limit bipolar limits the **acceleration change per time** during "Drive Halt"

See also the functional description: "Drive Stop"

S-0-0349 - Attributes

Para. Name:	**DE**	Ruck-Grenzwert bipolar		
	EN	Jerk limit bipolar		
	FR	Limite de Jerk bipolaire		
	ES	Límite sacudida bipolar		
	IT	Limite di Jerk bipol.		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 4000000.000		
Default value:		0	**Cyc. transmittable:**	MDT

S-0-0382, Intermediate power

Display of the DC-bus power.

S-0-0382 - Attributes

Para. Name:	**DE**	Zwischenkreisleistung		
	EN	Intermediate power		
	FR	Puissance circuit interméd.		
	ES	Potencia de circuito intermedio		
	IT	Potenza sul Bus DC		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		KW	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0383, Motor temperature

This parameter contains the measured motor temperature which is obtained from the motor temperature sensor attached to plug X6.

Remark:

For all motors except 2AD motors, a PTC resistor is used as the temperature sensor .

As the temperature curve in this case shows a considerable tolerance and in higher temperature ranges a considerable progression, the value in
S-0-0383, Motor temperature is not usable for these motor types.

See also the functional description: "Temperature monitoring".

S-0-0383 - Attributes

Para. Name:	**DE**	Motor-Temperatur		
	EN	Motor temperature		
	FR	Température moteur		
	ES	Temperatura de motor		
	IT	Temperatura Motore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0390, Diagnostic message number

In the parameter Diagnostic message number, the same number is stored as it can be seen in the seven segment display. This makes it possible for the control to generate its own diagnostics according to the diagnostic message number (for example in languages which are not stored as diagnostics in the drive).

Example:

Diagnostic Message: "F822 Motor encoder failure: signal too small" in parameter S-0-0095

Seven Segment Display: changing "F8" <=> "22"

Diagnostic message number: "F822(hex)" in parameter S-0-0390

See also "**S-0-0095, Diagnostic Message**".

S-0-0390 - Attributes

Para. Name:	**DE**	Diagnose Nummer		
	EN	Diagnostic message number		
	FR	Numéro message diagnostique		
	ES	Numero de diagnostico		
	IT	Numero Messaggio Diagnosi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0391, Monitoring window ext. feedback

Description:

This parameter defines the maximum allowable deviation of the **S-0-0051, Actual feedback value 1** and **S-0-0053, Actual feedback value 2**.

If this value is exceeded for longer than 20ms, then the error **F236, Excessive position feedback difference** will be generated.

The monitoring can be turned off by writing 0 to this parameter.

See also the functional description: "Actual feedback value monitoring".

S-0-0391 - Attributes

Para. Name:	**DE**	Überwachungsfenster externer Geber		
	EN	Monitoring window ext. feedback		
	FR	Fenêtre de surveillance du capteur ext.		
	ES	Ventana de control de encoder absoluto		
	IT	Finestra di Controllo del Encoder esterno		
Function:		Parameter	**Editability:**	P234
Data length:			**Memory:**	Param. EE
Format:			**Validity check:**	Phase3
Unit:			**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

S-0-0393, Command value mode for modulo format

The interpretation of position command values such as **S-0-0047, Position command value** and **S-0-0258, Target position** when the modulo function has been activated is dependent on the selected mode.

This parameter has an effect only when **S-0-0076, Position data scaling type** had been activated in the **modulo format**.

The following values can be parametrized:

S-0-0393:	Meaning:
0	Shortest Path
1	Positive Direction
2	Negative Direction

Fig. 2-36: Parametrizeable Values for S-0-0393

See also the functional description: "Processing Command Values in Modulo Format, Shortest Path - Direction Selection"

S-0-0393 - Attributes

Para. Name:	**DE**	Sollwertmodus im Moduloformat		
	EN	Command value mode for modulo format		
	FR	Mode consigne pour modulo		
	ES	Modo de valor nominal en formato de módulo		
	IT	Modo per Valori comandati modulo		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 2		
Default value:		0	**Cyc. transmittable:**	no

S-0-0400, Home switch

This parameter is used to assign an ID number to the home switch (external signal).

Application:

The IDN (and thus the feedback status of the home switch) can be assigned to a real-time status bit.

Structure of the parameter:

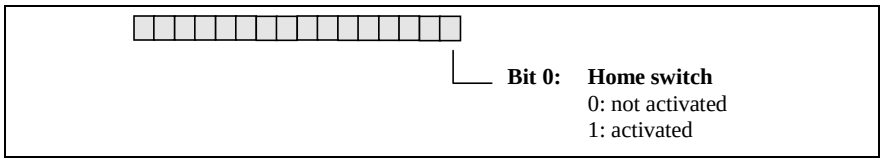

Fig. 2-37: S-0-0400, Home switch

See also the functional description: "Evaluation of the zero switch".

S-0-0400 - Attributes

Para. Name:	**DE**	Referenzpunktschalter		
	EN	Home switch		
	FR	Contact d'origine		
	ES	Interruptor de punto de referencia		
	IT	FC di Zero		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0401, Probe 1

This parameter is used to assign an ID number to Probe 1 (external signal). This makes it possible to assign Probe 1 to a real-time status bit, for example.

The signal Probe 1 is only polled by the drive and considered valid if the **S-0-0170, Probing cycle procedure command** is active and **S-0-0405, Probe 1 enable** is present.

Parameter structure:

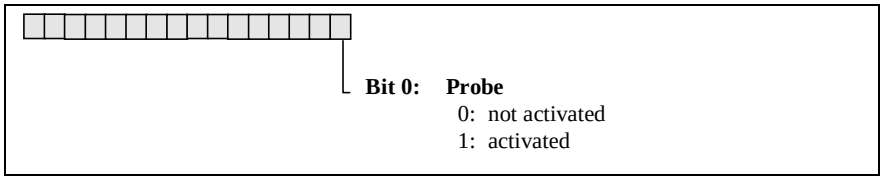

Fig. 2-38: S-0-0401, Probe 1

See also the functional description: "Probe Input Feature".

S-0-0401 - Attributes

Para. Name:	**DE**	Messtaster 1		
	EN	Probe 1		
	FR	Sonde 1		
	ES	Teclas de medicion 1		
	IT	Probe 1		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0402, Probe 2

This parameter is used to assign an ID number to Probe 2 (external signal). This makes it possible to assign Probe 2 to a real-time status bit, for example.

The signal Probe 2 is only polled by the drive and considered valid if the **S-0-0170, Probing cycle procedure command** is active and **S-0-0406, Probe 2 enable** is present.

Parameter structure:

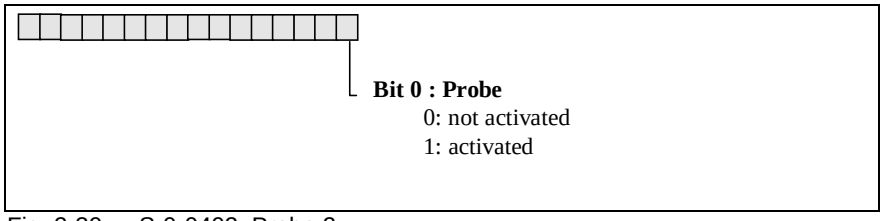

Fig. 2-39: S-0-0402, Probe 2

See also the functional description: "Probe Input Feature".

S-0-0402 - Attributes

Para. Name:	**DE**	Messtaster 2		
	EN	Probe 2		
	FR	Sonde 2		
	ES	Teclas de medicion 2		
	IT	Probe 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0403, Position feedback value status

When the bit 3 of **S-0-0147, Homing parameter** is set high, bit 0 of this parameter will be set high when the position feedback value is fixed in feference to the machine's zero point.

When the drive performs the commands **S-0-0148, C600 Drive controlled homing** procedure or **P-0-0012, C300 Command 'Set absolute measurement'**, the bit will be reset when they are started and then set 1 again once the command has been successfully completed.

The bit position feedback value status corresponds to the output signal "In reference".

In drives with Sercos interface, the position feedback value status can be assigned to a real-time status bit and thus be continuously communicated to the NC in the drive status word (see **S-0-0305, Allocation of real-time status bit 1**).

Structure of the parameter:

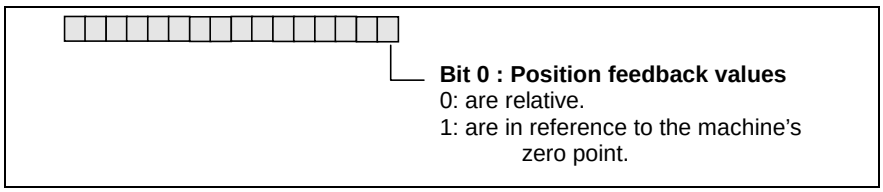

Fig. 2-40: S-0-0403, Position feedback value status

See also the functional description: "Drive-controlled homing".

S-0-0403 - Attributes

Para. Name:	**DE**	Status Lageistwerte		
	EN	Position feedback value status		
	FR	Etat de la valeur de retour de position		
	ES	Estado valores reales de posicion		
	IT	Stato del Feedback di Posizione		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0405, Probe 1 enable

This parameter is used to enable a probe input.

Changing this signal from 0 to 1 activates the trigger mechanism for evaluating the positive and/or negative slope of the probe signal.

The probe 1 enable can be assigned to a real-time control bit and thus be communicated to the master control word in the drive.

Parameter structure:

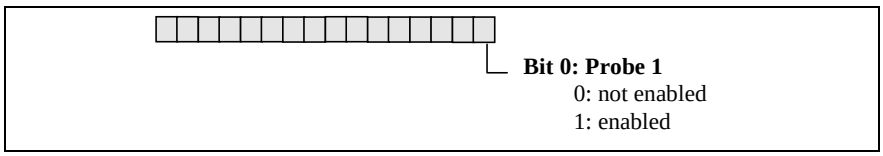

Fig. 2-41: S-0-0405, Probe 1 enable

See also the functional description: "Probe Input Feature".

S-0-0405 - Attributes

Para. Name:	**DE**	Messtaster 1 Freigabe		
	EN	Probe 1 enable		
	FR	Validation de la sonde 1		
	ES	Desbloqueo de teclas de medicion 1		
	IT	Probe 1 abilitato		
Function:		Parameter	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0406, Probe 2 enable

This parameter is used to enable a probe input.

Changing this signal from 0 to 1 activates the trigger mechanism for evaluating the positive and/or negative slope of the probe signal.

The probe 2 enable can be assigned to a real-time control bit and thus be communicated to the drive in the master control word.

Parameter structure:

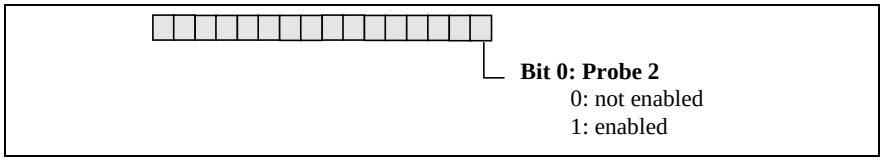

Fig. 2-42: S-0-0406, Probe 2 enable

See also the functional description: "Probe Input Feature".

S-0-0406 - Attributes

Para. Name:	**DE**	Messtaster 2 Freigabe		
	EN	Probe 2 enable		
	FR	Validation de la sonde 2		
	ES	Desbloqueo de teclas de medicion 2		
	IT	Probe 2 abilitato		
Function:		Parameter	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0409, Probe 1 positive latched

Bit 0 in this parameter will be set by the drive if

- the **S-0-0170, Probing cycle procedure command** is active,
- bit 0 in **S-0-0169, Probe control parameter** is set,
- **S-0-0405, Probe 1 enable** is present and
- the positive edge of **S-0-0401, Probe 1** is recognized.

The drive simultaneously stores the value of the selected signal in **S-0-0130, Probe value 1 positive edge**.

The drive clears the bit if the NC clears the **S-0-0170, Probing cycle procedure command** or if **S-0-0405, Probe 1 enable** has been set from 1 to 0.

The parameter "Probe 1 positive latched" can be assigned to a real-time status bit and thus be continuously communicated to the NC in the drive status word (see **S-0-0305, Allocation of real-time status bit 1**).

Parameter structure:

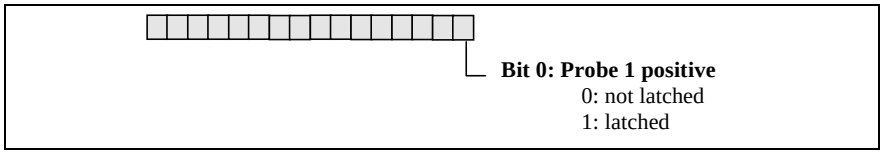

Fig. 2-43: S-0-0409, Probe 1 positive latched

See also the functional description: "Probe Input Feature".

S-0-0409 - Attributes

Para. Name:	**DE**	Messtaster 1 positiv gelatcht		
	EN	Probe 1 positive latched		
	FR	Sonde 1 déclenchée sur front montant		
	ES	Teclas de medicion 1 bloqueado positivo		
	IT	Probe 1 positivo rilevato		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0410, Probe 1 negative latched

Bit 0 in this parameter will be set by the drive if

- the **S-0-0170, Probing cycle procedure command** is active,
- bit 1 in **S-0-0169, Probe control parameter** is set,
- **S-0-0405, Probe 1 enable** is present and
- the negative edge of **S-0-0401, Probe 1** is recognized.

The drive simultaneously stores the value of the selected signal in **S-0-0131, Probe value 1 negative edge**.

The drive clears the bit if the NC clears the **S-0-0170, Probing cycle procedure command** or if **S-0-0405, Probe 1 enable** has been set from 1 to 0.

The parameter "probe 1 negative latched" can be assigned to a real-time status bit and thus be continuously communicated to the NC in the drive status word (see **S-0-0305, Allocation of real-time status bit 1**).

Parameter structure:

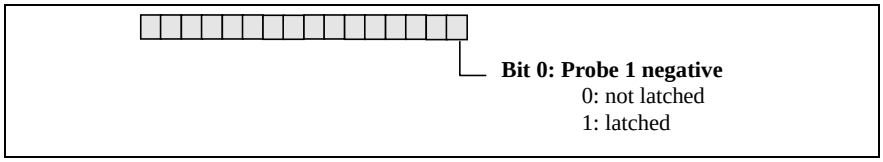

Fig. 2-44: S-0-0410, Probe 1 negative latched

See also the functional description: "Probe Input Feature".

S-0-0410 - Attributes

Para. Name:	**DE**	Messtaster 1 negativ gelatcht		
	EN	Probe 1 negative latched		
	FR	Sonde 1 déclenchée sur front descendant		
	ES	Teclas de medicion 1 bloqueado negativo		
	IT	Probe 1 negativo rilevato		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0411, Probe 2 positive latched

Bit 0 in this parameter will be set by the drive if

- the **S-0-0170, Probing cycle procedure command** is active,
- bit 3 in **S-0-0169, Probe control parameter** is set,
- **S-0-0406, Probe 2 enable** is present, and
- the positive edge of **S-0-0402, Probe 2** is recognized.

The drive simultaneously stores the value of the selected signal in **S-0-0132, Probe value 2 positive edge**.

The drive clears the bit if the NC clears the **S-0-0170, Probing cycle procedure command** or if **S-0-0406, Probe 2 enable** has been set from 1 to 0.

The parameter "Probe 2 positive latched" can be assigned to a real-time status bit and thus be continuously communicated to the NC in the drive status word (see **S-0-0305, Allocation of real-time status bit 1**).

Parameter structure:

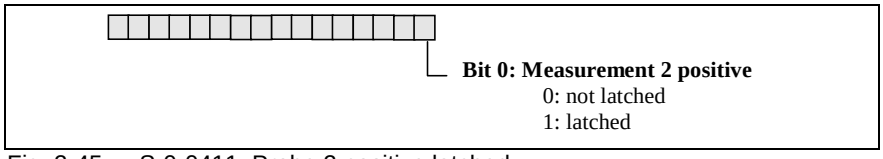

Fig. 2-45: S-0-0411, Probe 2 positive latched

See also the functional description: "Probe Input Feature".

S-0-0411 - Attributes

Para. Name:	**DE**	Messtaster 2 positiv gelatcht		
	EN	Probe 2 positive latched		
	FR	Sonde 2 déclenchée sur front montant		
	ES	Teclas de medicion 2 bloqueado positivo		
	IT	Probe 2 positivo rilevato		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-0-0412, Probe 2 negative latched

Description:

Bit 0 in this parameter will be set by the drive if

- the **S-0-0170, Probing cycle procedure command** is active,
- bit 3 in **S-0-0169, Probe control parameter** is set,
- **S-0-0406, Probe 2 enable** is present, and
- the negative edge of **S-0-0402, Probe 2** is recognized.

The drive simultaneously stores the value of the selected signal in **S-0-0133, Probe value 2 negative edge**.

The drive clears the bit if the NC clears the **S-0-0170, Probing cycle procedure command** or if **S-0-0406, Probe 2 enable** is set from 1 to 0.

The parameter "probe 2 negative latched" can be assigned to a real-time status bit and thus be continuously communicated to the NC in the drive status word (see **S-0-0305, Allocation of real-time status bit 1**).

Parameter structure:

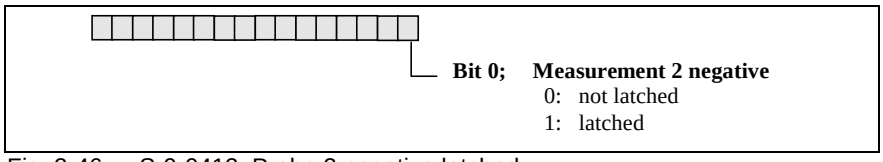

Fig. 2-46: S-0-0412, Probe 2 negative latched

See also the functional description: "Probe Input Feature".

S-0-0412 - Attributes

Para. Name:	**DE**	Messtaster 2 negativ gelatcht		
	EN	Probe 2 negative latched		
	FR	Sonde 2 déclenchée sur front descendant		
	ES	Teclas de medicion 2 bloqueado negativo		
	IT	Probe 2 negativo rilevato		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-7-0109, Motor peak current

Value in the feedback memory which specifies the maximum current which may flow in the motor for a short period without damaging it.

For MDD, MKD and MKE motors, the value will be copied into the active parameter S-0-0109, Motor peak current when the amplifier is turned on.

S-7-0109 - Attributes

Para. Name:	**DE**	Spitzenstrom Motor		
	EN	Motor peak current		
	FR	Courant crête du moteur		
	ES	Corriente punta de motor		
	IT	Corrente di Picco Motore		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		A	**Extrem value check:**	no
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		---	**Cyc. transmittable:**	no

S-7-0111, Motor current at standstill

Value in the feedback memory for the current which can continuously flow in the motor without damaging it.

For MDD, MKD and MKE motors, the value will be copied into the active parameter S-0-0111, Motor current at standstill when the amplifier is turned on.

S-7-0111 - Attributes

Para. Name:	**DE**	Stillstandstrom Motor		
	EN	Motor current at standstill		
	FR	Courant du moteur à l'arrêt		
	ES	Corriente de parada motor		
	IT	Corrente Motore con Asse fermo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		A	**Extrem value check:**	no
Decimal places:		3	**Combination check:**	no
Input min/max:		0.001 / 500.000		
Default value:		---	**Cyc. transmittable:**	no

S-7-0113, Maximum motor speed (nmax)

Value in the feedback memory for the maximum possible motor speed.

For MDD, MKD and MKE motors, the value will be copied into the active parameter S-0-0113, Maximum motor speed (nmax) when the amplifier is turned on.

S-7-0113 - Attributes

Para. Name:	**DE**	Maximalgeschwindigkeit des Motors		
	EN	Maximum motor speed (nmax)		
	FR	Vitesse maximale du moteur		
	ES	Velocidad maxima del motor		
	IT	Velocità massima Motore (nmax)		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		0 / 214738.3647		
Default value:		---	**Cyc. transmittable:**	no

S-7-0116, Resolution of motor feedback

Value in the feedback memory for resolution of the motor encoder.

For MDD, MKD and MKE motors, the value will be copied into the active parameter S-0-0116, Resolution of motor feedback when the amplifier is turned on.

S-7-0116 - Attributes

Para. Name:	**DE**	Auflösung Motorgeber		
	EN	Resolution of motor feedback		
	FR	Résolution du codeur moteur		
	ES	Resolucion encoder de motor		
	IT	Risoluzione Feedback Motore		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		Cycles/Rev	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

S-7-0141, Motor type

Text in the feedback memory for the motor type.

For MDD, MKD and MKE motors, the value will be copied into the active parameter S-0-0141, Motor type when the amplifier is turned on.

Examples:

MKD 071B-061-KP1-BN

MKE 096B-047-GG0-KN

S-7-0141 - Attributes

Para. Name:	**DE**	Motortyp		
	EN	Motor type		
	FR	Type de moteur		
	ES	Tipo de motor		
	IT	Tipo Motore		
Function:		Parameter	**Editability:**	no
Data length:		1Byte variabel	**Memory:**	Feedb. EE
Format:		ASCII	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		-	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

3 Product-specific parameters

P-0-0004, Velocity loop smoothing time constant

The time constant that can be activated in this parameter affects the output of the velocity loop controller. It can be used to suppress quantization effects and limit the bandwidth of the velocity loop controller.The limit frequency is derived from smoothing time constant T resulting from the relationship

$$f_g = \frac{1}{2 \cdot \pi \cdot \mathrm{T}}$$

Inputting the minimum input value turns the filter off.

See also the functional description: "Setting the velocity controller".

P-0-0004 - Attributes

Para. Name:	**DE**	Drehzahlregler-Glättungszeitkonstante		
	EN	Velocity loop smoothing time constant		
	FR	Constante de temps de filtrage boucle de vitesse		
	ES	Constante de tiempo de suavizado n.d.r.		
	IT	Costante di Tempo per Smorzamento nell'Anello di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		250 / 65500		
Default value:		250	**Cyc. transmittable:**	no

P-0-0005, Language selection

All parameter names, units and diagnostic / fault messages are stored in several languages in the drive controller. The language to be used for the texts must be set in this parameter.

- 0 : German
- 1 : English
- 2 : French
- 3 : Spanish
- 4 : Italian

Note: Functions like **S-0-0265, Language selection**.

See also the functional description: "Language Selection".

P-0-0005 - Attributes

Para. Name:	**DE**	Sprach-Umschaltung		
	EN	Language selection		
	FR	Sélection de langue		
	ES	Conmutacion de lengua		
	IT	Selezione Lingua		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 4		
Default value:		---	**Cyc. transmittable:**	no

P-0-0008, Activation E-Stop function

Parameter P-0-0008 can be used to activate the E-Stop input and to select a response for bringing the drive to standstill.

Parameter structure:

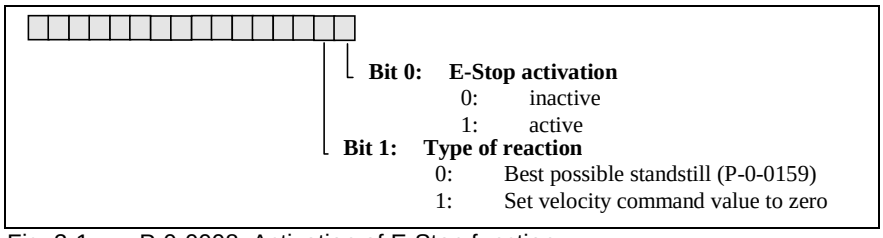
Bit 0: E-Stop activation
0: inactive
1: active
Bit 1: Type of reaction
0: Best possible standstill (P-0-0159)
1: Set velocity command value to zero

Fig. 3-1: P-0-0008, Activation of E-Stop function

The input polarity cannot be selected. It is always 0-active i.e., 0V on E6 of the X12 connector means the E-Stop is active.

Note: In addition, bit 0 activates monitoring of the external 24V current.

See also the functional description: "Activation and polarity of the E-Stop input".

P-0-0008 - Attributes

Para. Name:	**DE**	Aktivierung E-Stop-Funktion		
	EN	Activation E-Stop function		
	FR	Activation fonction Arrêt d'Urgence		
	ES	Activacion funcion parada de emergencia		
	IT	Attivazione della Funzione E-Stop		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0009, Error message number

If the drive diagnosis a class 1 diagnostic error, then a bit gets in parameter **S-0-0011, Class 1 diagnostics**. Bit 13 is set in the operation status word for ‘’Error in class 1 diagnostic’’.

Additionally, for a precise diagnosis:

- the diagnosis number is displayed in the 7-segment display and stored in parameter **S-0-0390, Diagnostic message number,**
- the clear text diagnosis is stored in parameter **S-0-0095, Diagnostic message**
- and the relevant error number is stored in **paramter P-0-0009, Error message number**.

If no error is pending, then the value of parameter **P-0-0009 Error message number** is 0.

Example:

Pending error:

S-0-0095: "F822 Motor encoder failure: signal too small"

Diagnostics:

S-0-0390 F822 (hex)

P-0-0009: 822 (decimal)

7-segment display: Changing between F8 and 22

See also the functional description: "Error number".

P-0-0009 - Attributes

Para. Name:	**DE**	Fehler-Nummer		
	EN	Error message number		
	FR	Numéro erreur		
	ES	Error numero		
	IT	Numero Messaggio Errore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0010, Excessive position command value

In position control mode (S-0-0032..35 = 0x0003, 0x0004, 0x000B or 0x000C), the NC sets position commands at constant intervals (all **S-0-0001, NC Cycle time (TNcyc)**). Within the drive, the difference of two sequential position commands are monitored for excessive values, i.e., the position commands must satisfy:

$$\frac{X_{Soll}(k) - X_{Soll}(k-1)}{S-0-0001} \leq S-0-0091$$

whereby:
Xsoll(k) = NC position command in current cycle
Xsoll(k-1) = NC position command in previous cycle
S-0-0091, Bipolar velocity limit value
S-0-0001, NC Cycle time (TNcyc)

If the above condition is violated, then error **F237, Excessive position command difference** is triggered and the drive decelerantes as set in parameter **P-0-0119, Best possible decleration**.

The error triggering excessive position command value ($X_{soll}(k)$)is stored in parameter **P-0-0010, Excessive position command value**, the last valid position command ($X_{soll}(k-1)$) in parameter **P-0-0011, Last valid position command value**.

See also the functional description: "Position command value monitoring".

P-0-0010 - Attributes

Para. Name:	**DE**	Exzessiver Lagesollwert		
	EN	Excessive position command value		
	FR	Consigne de position excessive		
	ES	Valor nominal de posicion excesivo		
	IT	Posizione comandata eccessiva		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0011, Last valid position command value

In position control mode (S-0-0032...35 = 0x0003, 0x0004, 0x000B or 0x000C), the NC sets position commands at constant intervals (**all S-0-0001, NC Cycle time (TNcyc)**). The difference of two sequential position commands is monitored for excessive value. The positions command values must satisfy.

$$\frac{X_{Soll}(k) - X_{Soll}(k-1)}{S-0-0001} \leq S-0-0091$$

whereby:
Xsoll(k) = NC-position command in current cycle
Xsoll(k-1) = NC-position command in previous cycle
S-0-0091, Bipolar velocity limit value
S-0-0001, NC Cycle time (TNcyc)

If the above condition is violated, then error **F237, Excessive position command difference** is triggered and the drive decelerantes as set in parameter **P-0-0119, Best possible decleration**.

The error triggering excessive position command value ($X_{soll}(k)$)is stored in parameter **P-0-0010, Excessive position command value**, the last valid position command ($X_{soll}(k-1)$) in parameter **P-0-0011, Last valid position command value**.

See also the functional description: "Position command value monitoring".

P-0-0011 - Attributes

Para. Name:	**DE**	Letzter gültiger Lagesollwert		
	EN	Last valid position command value		
	FR	Dernière consigne de position valable		
	ES	Valor nominal de posicion ultimo valido		
	IT	Ultima Posizione comandata valida		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0012, C300 Command 'Set absolute measurement'

When an absolute measuring system is started for the first time, the drive will indicate a random feedback value that is not referenced to the machine zero-point.

The position feedback of this measuring system can be set to the desired value with the command "Set absolute measurement". After the "Set absolute measurement" command is executed, the position feedback value of the measurement-supplied encoder will contain a defined reference to the machine zero-point. In this case, the value of parameter **S-0-0403, Position feedback value status** is 0.

All information will be available after reset because all necessary data from the absolute measurement system is buffered in feedback data memory or in parameter data memory. The position feedback value permanently retains its reference to the machine zero-point.

Parameter P-0-0012, C300 Command 'Set absolute measurement' can be used to execute this function.

See also the functional description: "Set absolute measuring"

P-0-0012 - Attributes

Para. Name:	**DE**	C300 Kommando Absolutmaß setzen		
	EN	C300 Command 'Set absolute measurement'		
	FR	C300 Commande du chargement de valeur absolue		
	ES	C300 Poner medicion absoluta de comando		
	IT	C300 Comando Azzeramento Encoder assoluto		
Function:		Command	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0014, D500 Command determine marker position

The command **P-0-0014, D500 Command determine marker position** is used to check the detection of the reference marker of an incremental measuring system. If there is an incremental measuring system and the command has been activated, then the actual position of the measuring system, once detected is stored in parameter **S-0-0173, Marker position A.** It is then signalled that the command is completed. Given 2 measuring systems,the bit 3 in **S-0-0147, Homing parameter** determines which measuring system is used.

See also the functional description: "Command - detect marker position"

P-0-0014 - Attributes

Para. Name:	**DE**	D500 Kommando Markerposition ermitteln		
	EN	D500 Command determine marker position		
	FR	D500 Commande évaluation position marqueur		
	ES	D500 Comando calcular posicion de marcador		
	IT	D500 Comando prendere posizione marca		
Function:		Command	**Editability:**	P4
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 3		
Default value:		0	**Cyc. transmittable:**	no

P-0-0015, Memory address

This parameter can be used to select a memory address in the drive for operation-internal test purposes. The contents will be displayed in parameter **P-0-0016, Content of memory address**.

P-0-0015 - Attributes

Para. Name:	**DE**	Speicheradresse		
	EN	Memory address		
	FR	Adresse mémoire		
	ES	Direccion de memoria		
	IT	Indirizzo Memoria		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 0xffff		
Default value:		0x8000	**Cyc. transmittable:**	no

P-0-0016, Content of memory address

This parameter displays the contents of the memory address set in parameter **P-0-0015, Memory address** (for operation-internal test purposes only!).

P-0-0016 - Attributes

Para. Name:	**DE**	Inhalt der Speicheradresse		
	EN	Content of memory address		
	FR	Contenu de l'adresse mémoire		
	ES	Contenido de la direccion de memoria		
	IT	Contesto degli Indirizzi di Memoria		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0018, Number of pole pairs/pole pair distance

This indicates the **number of pole pairs** per motor revolution **for rotating motors**.

For **linear motors**, the **length of a pole pair** must be indicated here.

This value does not need to be indicated here for motors with motor feedback data memory, like MKD.

See also the functional description: "Motor Feedback-Data Memory"

P-0-0018 - Attributes

Para. Name:	**DE**	Polpaarzahl/Polpaarweite		
	EN	Number of pole pairs/pole pair distance		
	FR	Nombre de paires de pôles/distance polaire		
	ES	Numero de par de polo/espacio de par de polo		
	IT	Numero di Coppie Poli		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		pairs of poles/mm	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		3	**Cyc. transmittable:**	no

P-0-0019, Position start value

The position start value sets a parameter for a defined initialization value for position feedback values 1 and 2 in non-absolute measurement systems.

During initialization of the position feedback value with command **S-0-0128, C200 Communication phase 4 transition check**, the drive

checks whether the position start value was written in communications phase 2 or 3. Only then will position feedback values 1 and 2 be set to that value. The position start value is used only for non-absolute encoders.

See also the functional description: "Non-absolute measurement systems after initialization"

P-0-0019 - Attributes

Para. Name:	**DE**	Lageanfangswert		
	EN	Position start value		
	FR	Position à la mise sous tension		
	ES	Valor inicial de posicion		
	IT	Valore di Posizione di Partenza		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-2147483648 / 2147483647		
Default value:		---	**Cyc. transmittable:**	no

P-0-0021, List of scope data 1

The measured values of channel 1 of the oscilloscope function are stored in chronological sequence in parameter **P-0-0022, List of scope data 2** (the oldest scope value is the first element of the list).

See also the functional description: "Oscilloscope Feature".

P-0-0021 - Attributes

Para. Name:	**DE**	Messwertliste 1		
	EN	List of scope data 1		
	FR	Liste des valeurs mesurées 1		
	ES	Lista de valor de medicion 1		
	IT	Lista Misure 1		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		P-0-0023	**Validity check:**	no
Unit:		P-0-0023	**Extrem value check:**	no
Decimal places:		P-0-0023	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0022, List of scope data 2

The measured values of channel 2 of the oscilloscope function are stored in chronological sequence in parameter **P-0-0022, List of scope data 2** (the oldest scope value is the first element of the list).

See also the functional description: "Oscilloscope Feature".

P-0-0022 - Attributes

Para. Name:	**DE**	Messwertliste 2		
	EN	List of scope data 2		
	FR	Liste des valeurs mesurées 2		
	ES	Lista de valor de medicion 2		
	IT	Lista Misure 2		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		P-0-0024	**Validity check:**	no
Unit:		P-0-0024	**Extrem value check:**	no
Decimal places:		P-0-0024	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0023, Signal select scope channel 1

Parameter P-0-0023 determines the signal that will be recorded. The following fixed, defined signals are available:

Number	Signal selection	Unit of the scope data list
0 x 00	Channel not activated	--
0 x 01	Actual feedback value dependent on operating mode S-0-0051 or S-0-0053	Dependent on position scaling
0 x 02	Velocity value parameter (S-0-0040)	Dependent on velocity scaling
0 x 03	Velocity control deviation (-S-0-0347)	Dependent on velocity scaling
0 x 04	Following error parameter (S-0-0189)	Dependent on position scaling
0 x 05	Torque/force command value parameter S-0-0080	Percent
0 x 06	Not in use	--

Fig. 3-2: P-0-0023, Signal numbers

Expanded oscilloscope recording feature:

In addition to fixed, defined signal selection, it is also possible to record any memory addresses of the drive. To do this, bit 12 = 1 must be set. Bit 13 defines the data length of the memory signal in question.

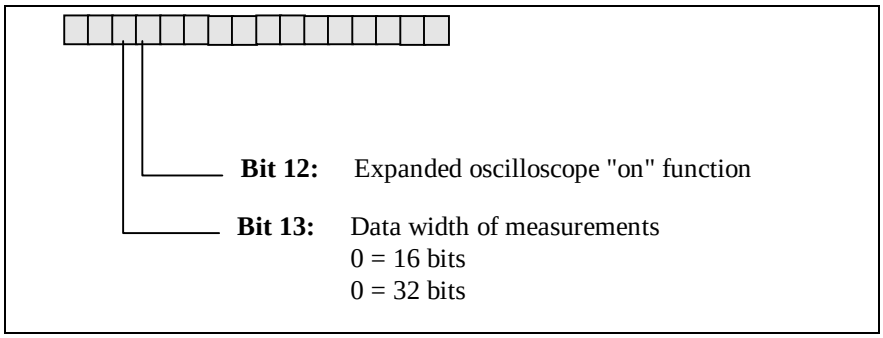

Fig. 3-3: P-0-0023, & P-0-0024, Oscilloscope function signal selection

See also the functional description: "Oscilloscope Feature".

P-0-0023 - Attributes

Para. Name:	**DE**	Signalauswahl 1 Oszilloskopfunktion		
	EN	Signal select scope channel 1		
	FR	Fonction oscilloscope, sélection signal 1		
	ES	Seleccion de señal 1 funcion de osciloscopio		
	IT	Segnale Selezionato Canale 1		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffff		
Default value:		0	**Cyc. transmittable:**	no

P-0-0024, Signal select scope channel 2

Parameter P-0-0024 determines the signal that will be recorded. The following fixed, defined signals are available:

Number	Signal selection	Unit of the scope data (probe value) list
0 x 00	Channel not activated	--
0 x 01	Actual feedback value dependent on operating mode S-0-0051 or S-0-0053	Dependent on position scaling
0 x 02	Velocity value parameter (S-0-0040)	Dependent on velocity scaling
0 x 03	Velocity control deviation (-S-0-0347)	Dependent on velocity scaling
0 x 04	Following error parameter (S-0-0189)	Dependent on position scaling
0 x 05	Torque/force command value parameter S-0-0080	Percent
0 x 06	Not in use	--

Fig. 3-4: P-0-0024, Signal numbers

Expanded oscilloscope recording feature:

In addition to fixed, defined signal selection, it is also possible to record any memory addresses of the drive. To do this, bit 12 = 1 must be set. Bit 13 defines the data length of the memory signal in question.

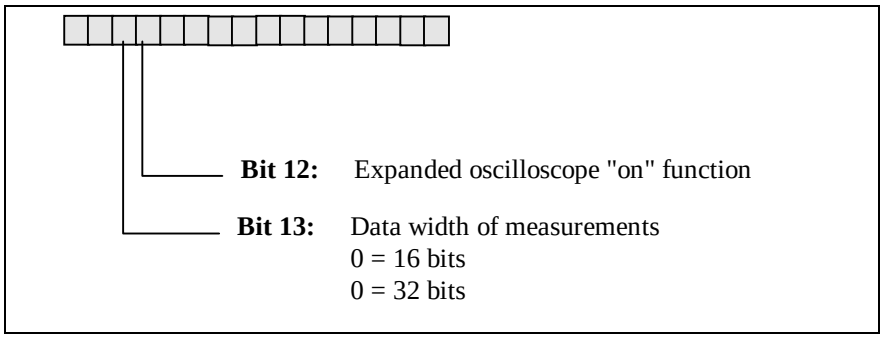

Fig. 3-5: P-0-0023, and P-0-0024, Oscilloscope function signal selection

See also the functional description: "Oscilloscope Feature".

P-0-0024 - Attributes

Para. Name:	**DE**	Signalauswahl 2 Oszilloskopfunktion		
	EN	Signal select scope channel 2		
	FR	Fonction oscilloscope, sélection signal 2		
	ES	Seleccion de señal 2 funcion de osciloscopio		
	IT	Segnale Selezionato Canale 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffff		
Default value:		0	**Cyc. transmittable:**	no

P-0-0025, Trigger source

Parameter P-0-0025 defines the source that initiates the trigger signal. There is a choice between

- External trigger
- Internal trigger

External trigger (P-0-0025 = 0x01)

If an external trigger is chosen, then the trigger will be initiated by bit 0 of the trigger command word.

Internal trigger (P-0-0025 = 0x02)

If an internal trigger is selected, then the trigger signal set by parameter will be monitored for the trigger condition, and the trigger will be initiated as soon as the condition is met.

See also the functional description: "Oscilloscope Feature".

P-0-0025 - Attributes

Para. Name:	**DE**	Triggerquelle Oszilloskopfunktion		
	EN	Trigger source		
	FR	Source de déclenchement pour fonction oscilloscope		
	ES	Origen de trigger osciloscopio		
	IT	Sorgente Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 2		
Default value:		2	**Cyc. transmittable:**	no

P-0-0026, Trigger signal selection

For internal trigger sources, parameter P-0-0026 defines the signal that is monitored for the trigger condition that was set by parameter. The following fixed, defined signals are available:

Trigger signal numbers	Trigger signal	Corresponding trigger threshold
0 x 00	Not defined	Not defined
0 x 01	Actual feedback value based on mode of operation	Position data (P-0-0027)
0 x 02	Velocity feedback value Parameter S-0-0040	Velocity data (P-0-0028)
0 x 03	Velocity deviation parameter --	Velocity data (P-0-0028)
0 x 04	Following error parameter S-0-0189	Position data (P-0-0027)
0 x 05	Torque command value parameter S-0-0080	Torque data (P-0-0029)

Fig. 3-6: P-0-0026, Trigger signal selection

Additional trigger signals can also be defined by setting bit 12.

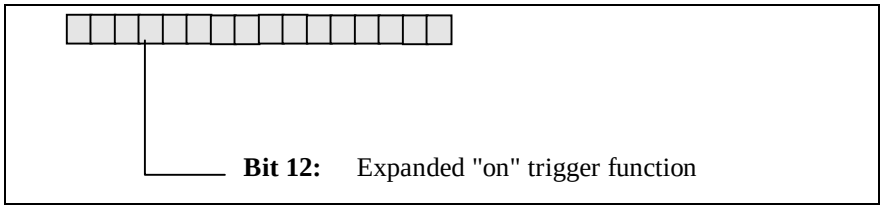

Fig. 3-7: P-0-0026, Trigger signal selection

See also the functional description: "Oscilloscope Feature".

P-0-0026 - Attributes

Para. Name:	**DE**	Triggersignalauswahl Oszilloskopfunktion		
	EN	Trigger signal selection		
	FR	Fonction oscilloscope, sélection signal de déclenc.		
	ES	Seleccion de señal de trigger funcion osciloscopio		
	IT	Segnale di Trigger selezionato		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0x5		
Default value:		1	**Cyc. transmittable:**	no

P-0-0027, Triggerlevel for position data

Parameter P-0-0027 determines given **P-0-0026, Trigger signal selection** oscilloscope function=“1“or “4“, the position value at which the trigger will be released as long as the correct edge has been recognized.

See also the functional description: "Oscilloscope Feature".

P-0-0027 - Attributes

Para. Name:	**DE**	Triggerschwelle für Lagedaten		
	EN	Triggerlevel for position data		
	FR	Seuil de déclenchement données de position		
	ES	Umbral de trigger para datos de posicion		
	IT	Livello di Trigger per Dati di Posizione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

P-0-0028, Triggerlevel for velocity data

Parameter P-0-0028 determines given **P-0-0026, Trigger signal selection** oscilloscope function=“2“or “3“, the actual speed value at which the trigger will be released as long as the correct edge has been recognized.

See also the functional description: "Oscilloscope Feature".

P-0-0028 - Attributes

Para. Name:	**DE**	Triggerschwelle für Geschwindigkeitsdaten		
	EN	Triggerlevel for velocity data		
	FR	Seuil de déclenchement données de vitesse		
	ES	Umbral de trigger para datos de velocidad		
	IT	Livello di Trigger per Dati di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0044	**Extrem value check:**	yes
Decimal places:		S-0-0044	**Combination check:**	no
Input min/max:		S-0-0044 / S-0-0044		
Default value:		0	**Cyc. transmittable:**	no

P-0-0029, Triggerlevel for torque/force data

Parameter P-0-0029 determines given **P-0-0026, Trigger signal selection** oscilloscope function="5", the torque force value at which the trigger will be released as long as the correct edge has been recognized.

See also the functional description: "Oscilloscope Feature".

P-0-0029 - Attributes

Para. Name:	**DE**	Triggerschwelle für Drehmoment-/Kraftdaten		
	EN	Triggerlevel for torque/force data		
	FR	Seuil de déclenchement données de couple		
	ES	Umbral de trigger para datos de par/fuerza		
	IT	Livello di Trigger per Dati Coppia/Forza		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		%	**Extrem value check:**	yes
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		S-0-0086 / S-0-0086		
Default value:		0	**Cyc. transmittable:**	no

P-0-0030, Trigger edge

Parameter P-0-0030 trigger edge defines the signal change at which a trigger event can be initiated.

Number:	Trigger edge:
1	Triggering on the positive edge of the trigger signal
2	Triggering on the negative edge of the trigger signal
3	Triggering on both the positive edge and negative edge of the trigger signal
4	Triggering if the trigger signal equals the trigger level

Fig. 3-8: Selection of trigger edges

See also the functional description: "Oscilloscope Feature".

P-0-0030 - Attributes

Para. Name:	**DE**	Triggerflanke		
	EN	Trigger edge		
	FR	Front de déclenchement		
	ES	Lado de trigger		
	IT	Fronte di Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 4		
Default value:		3	**Cyc. transmittable:**	no

P-0-0031, Timebase

Timebase defines the time intervals within which the probe values of the selected signals are defined. Possible time intervals range from 250 µs to 100 ms.

Note that in general:

Recording duration = Time resolution • Size of memory [µs]

See also the functional description: "Oscilloscope Feature".

P-0-0031 - Attributes

Para. Name:	**DE**	Zeitauflösung		
	EN	Timebase		
	FR	Base de temps		
	ES	Resolucion de tiempo		
	IT	Base dei Tempi		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		us	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		250 / 100000		
Default value:		250	**Cyc. transmittable:**	no

P-0-0032, Size of memory

The size of memory determines the number of recorded probe values per measurement. A maximum of 512 probe values can be recorded per channel.

The memory size and time resolution together determine the recording duration. The minimum recording duration is 128 ms, and the maximum duration is 51.2 s.

Note that in general:

Recording duration = Time resolution • Size of memory [us]

See also the functional description: "Oscilloscope Feature".

P-0-0032 - Attributes

Para. Name:	**DE**	Speichertiefe		
	EN	Size of memory		
	FR	Taille mémoire		
	ES	Tamaño de memoria		
	IT	Dimensione Memoria		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		2 / 512		
Default value:		512	**Cyc. transmittable:**	no

P-0-0033, Number of samples after trigger

Parameter P-0-0033 defines the number of probe values, or samples, that will be entered in the probe value list after the trigger event. In this way it is possible to set a parameter to define a trigger delay. Parameter P-0-0033 is used for this.

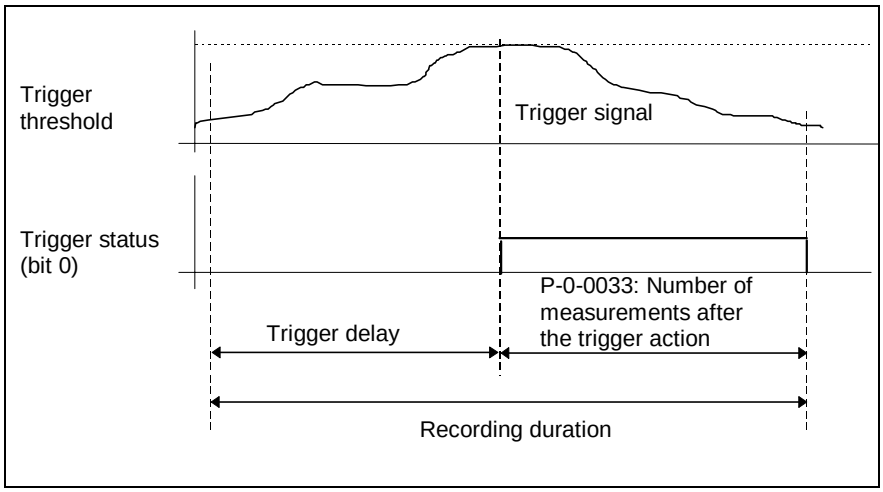

Fig. 3-9: Triggering

See also the functional description: "Oscilloscope Feature".

P-0-0033 - Attributes

Para. Name:	**DE**	Anzahl der Messwerte nach Triggerereignis		
	EN	Number of samples after trigger		
	FR	Nombre de mesures après déclenchement		
	ES	Numero de muestras despues de trigger		
	IT	Numero di Campionamenti dopo Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 512		
Default value:		0	**Cyc. transmittable:**	no

P-0-0035, Delay from trigger to start

Parameter P-0-0035 indicates the number of cycles between the trigger event (internal) and the release of the trigger (bit 0 trigger control word) in external triggering.

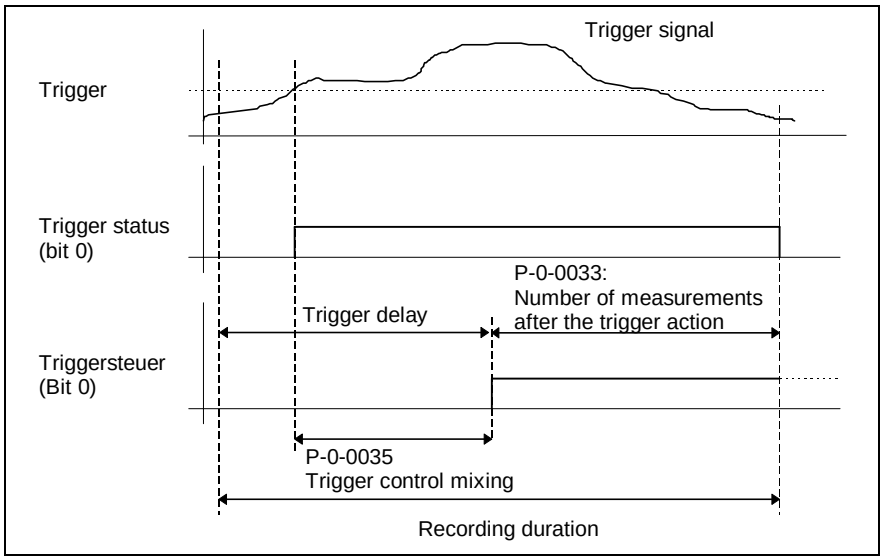

Fig. 3-10: Triggering

Since there is a delay between transmission of the trigger event by the control system and release of the trigger, the delay is measured by the drive controller and stored in parameter **P-0-0035, Delay from trigger to start**. A time-correct display of signals is ensured by using this parameter for visualizing the probe values.

See also the functional description: "Oscilloscope Feature".

P-0-0035 - Attributes

Para. Name:	**DE**	Triggersteuerversatz		
	EN	Delay from trigger to start		
	FR	Délai de déclenchement		
	ES	Retardo de mando de trigger		
	IT	Ritardo del Trigger dopo Start		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0036, Trigger control word

Parameter P-0-0036 controls the oscilloscope function.

- Bit 2 activates the function, i.e., the lists of scope data are filled with the selected data.
- Bit 1 activates trigger monitoring.
- Bit 0 can initiate a trigger event. If a valid edge is recognized, the probe-value memory will be completed as specified by parameter **P-0-0033, Number of samples after the trigger**, and the oscilloscope function will be deactivated by resetting bits 1 and 2 in the trigger control word.

Parameter structure

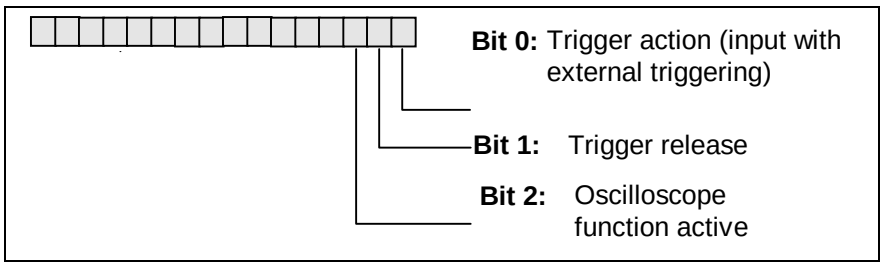

Fig. 3-11: P-0-0036, Trigger control word

See also the functional description: "Oscilloscope Feature".

P-0-0036 - Attributes

Para. Name:	**DE**	Triggersteuerwort		
	EN	Trigger control word		
	FR	Mot de commande déclenchement		
	ES	Palabra de mando de trigger		
	IT	Controllo Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0037, Trigger status word

Status messages for the oscilloscope function.

Parameter P-0-0037 offers various pieces of information about the current status of the oscilloscope function.

Parameter structure

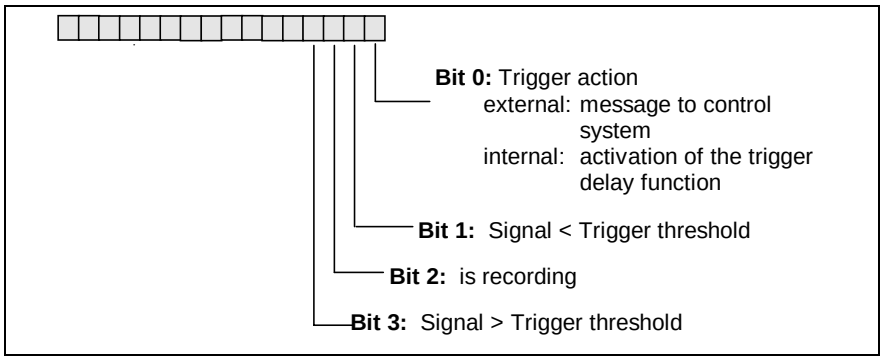

Fig. 3-12: P-0-0037, Trigger status word

See also the functional description: "Oscilloscope Feature".

P-0-0037 - Attributes

Para. Name:	**DE**	Triggerstatuswort		
	EN	Trigger status word		
	FR	Mot d'état déclenchement		
	ES	Palabra de estado de trigger		
	IT	Stato Trigger		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0051, Torque/force constant

The torque/force constant determines what drive torque or force the motor will deliver at a specific effective current.

For synchronous motors, this value depends entirely on the design of the motor.

In asynchronous motors, this value is valid only when the motor is not operated in the field-weakening range.

For MDD, MKD and MKE motors, this parameter is stored in feedback data memory and cannot be changed.

$$Ma[Nm;N] = (P-0-0051) \cdot (S-0-0111) \cdot (S-0-0080)$$

where:

Ma	= Drive torque
P-0-0051	= Torque/force constant [N/A]
S-0-0111	= Motor current at standstill [A]
S-0-0080	= Torque/force command [%]

Fig. 3-13: Drive torque

See also the functional description: "Motor Feedback-Data Memory"

P-0-0051 - Attributes

Para. Name:	**DE**	Drehmoment-/Kraft-Konstante		
	EN	Torque/force constant		
	FR	Constante de couple		
	ES	Constante de par/fuerza		
	IT	Costante di Coppia		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		Nm/A	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		1 / 65535		
Default value:		100	**Cyc. transmittable:**	no

P-0-0074, Interface feedback 1

This parameter determines the encoder interface to which the motor encoder is connected. The number of the corresponding interface module should be entered in this parameter.

Module:	P-0-0074:	Measurement system:
-	0	None (only with rotary asynchronous motors)
Standard	1	Digital servo feed back or resolver
DLF01.1M	2	Incremental encoder with sine signals from the Heidenhain company, with either µA or 1V signals
DZF02.1M	3	Indramat gear-type encoder
DEF01.1M	5	Incremental encoder with square-wave signals from the Heidenhain company
DAG01.1M	8	Encoder with EnDat interface from the Heidenhain company
DZF03.1M	9	Gearwheel with 1Vpp signals
Standard	10	Resolver without feedback data memory
Standard + DLF01.1M	11	Resolver without feedback data memory plus incremental encoder with sine signals

Restrictions:

Modules DLF, DZF, DRF and DEF 1 must not be operated simultaneously in a controller. => **Danger of Damage!**

It is not possible to combine DLF and DZF.
Module DEF 2 can be used to operate an incremental encoder along with DLF or DZF.

See also the functional description: "Determining the Feedback Interface of the Motor Feedback"

P-0-0074 - Attributes

Para. Name:	**DE**	Motorgeberinterface		
	EN	Interface feedback 1		
	FR	Interface codeur moteur		
	ES	Interface encoder de motor		
	IT	Interfaccia Feedback 1		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / --		
Default value:		1	**Cyc. transmittable:**	no

P-0-0075, Interface feedback 2, external

This parameter determines the encoder interface to which the external encoder is connected. The number of the corresponding interface module should be entered in this parameter.

Module:	P-0-0075:	Measurement system:
--	0	None
Standard	1	Digital servo feedback
DLF01.1M	2	Incremental encoder with sine signals from the Heidenhain Company, with either uA or 1V signals
DZF02.1M	3	Indramat gear-type encoder
DFF01.1M	4	Digital servo feedback from the Heidenhain or Stegmann companies
DEF01.1M	5	Incremental encoder with square-wave signals from the Heidenhain company
DEF02.1M	6	Incremental encoder with square-wave signals from the Heidenhain company
DAG01.2M	7	Encoder with SSI interface
DAG01.2M	8	Encoder with EnDat interface
DZF03.1M	9	Gearwheel encoder with 1Vpp signals

Fig. 3-14: P-0-0075, Interface feedback 2, external

Restrictions:

Modules DLF, DZF, DRF and DEF 1 must not be operated simultaneously in a controller. => **Danger of Damage!**

It is not possible to combine DLF and DZF.
Module DEF 2 can be used to operate an incremental encoder along with DLF or DZF.

See also the functional description: "Determining the Feedback Interface of the Motor Feedback"

P-0-0075 - Attributes

Para. Name:	**DE**	Externes Geberinterface		
	EN	Interface feedback 2, external		
	FR	Interface 2, codeur externe		
	ES	Interface 2, encoder externo		
	IT	Interfaccia Feedback 2, esterno		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 9		
Default value:		0	**Cyc. transmittable:**	no

P-0-0081, Parallel I/O output 1

The control system can use this parameter to address the outputs of the DEA 4.1 I/O card.

See also the functional description: "Digital input/output".

P-0-0081 - Attributes

Para. Name:	**DE**	Paralleler Ausgang 1		
	EN	Parallel I/O output 1		
	FR	Sortie parallèle 1		
	ES	Salida paralela 1		
	IT	Uscita parallela 1		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 0xffff		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0082, Parallel I/O input 1

The control system can use this parameter to address the inputs of the DEA 4.1 I/O card.

See also the functional description: "Digital input/output"

P-0-0082 - Attributes

Para. Name:	**DE**	Paralleler Eingang 1		
	EN	Parallel I/O input 1		
	FR	Entrée parallèle 1		
	ES	Entrada paralela 1		
	IT	Ingressi paralleli 1		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 0xffff		
Default value:		---	**Cyc. transmittable:**	AT

P-0-0090, Travel limit parameter

Parameter P-0-0090 activates the travel limit switch. In addition, the inputs can be inverted (0V on E2/3 => Trave l limit exceeded).

Parameter structure:

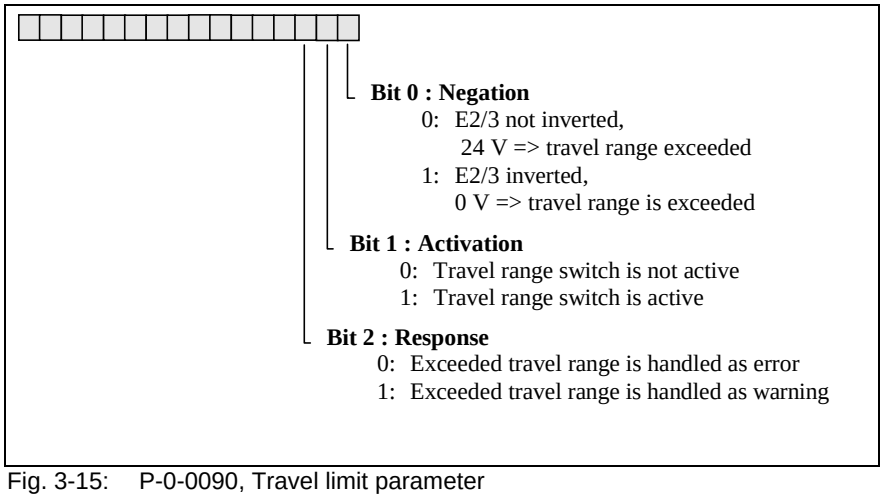
Bit 0 : Negation
0: E2/3 not inverted,
24 V => travel range exceeded
1: E2/3 inverted,
0 V => travel range is exceeded
Bit 1 : Activation
0: Travel range switch is not active
1: Travel range switch is active
Bit 2 : Response
0: Exceeded travel range is handled as error
1: Exceeded travel range is handled as warning

Fig. 3-15: P-0-0090, Travel limit parameter

Note: In addition, bit 1 activates monitoring of the external 24V current.

See also the functional description: "Travel range limits"

P-0-0090 - Attributes

Para. Name:	**DE**	Fahrbereichsgrenzschalter-Parameter		
	EN	Travel limit parameter		
	FR	Paramètres de butées hardware		
	ES	Parametros limite de desplazamiento		
	IT	Parametro Limite Percorso		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 0		
Default value:		3	**Cyc. transmittable:**	no

P-0-0096, Distance to move in error situation

By inputting a 3 in parameter **P-0-0119, Best possible declaration**, the reaction "return motion“ can be set. A switch into best possible standstill takes place and the path parametrized here starting with the current feedback position value is traversed (the qualifying sign is noted). The **S-0-0091, Bipolar velocity limit value**, **S-0-0138, Bipolar acceleration limit value** and **S-0-0349, Jerk limit bipolar** hereby not exceeded.

It is necessary to parametrize a sufficiently sized value in **P-0-0126, Maximum braking time** to give the drive enough time to traverse the spezified path.

If the position limit values are active, then the drive keeps the return motion from traversing them. The drive then stops at the **S-0-0057, Position window** at the respective position limit value.

See also the functional description: "Return motion"

P-0-0096 - Attributes

Para. Name:	**DE**	Verfahrweg im Fehlerfall		
	EN	Distance to move in error situation		
	FR	Déplacement en cas de défaut		
	ES	Recorrido de desplazamiento en caso de error		
	IT	Distanza Movimento in Caso di Errore		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		100000	**Cyc. transmittable:**	no

P-0-0097, Absolute encoder monitoring window

When absolute encoder monitoring is used, the switch command 3 → 4 compares the saved feedback value with the current feedback value of the axis.

If the difference is greater than what is set in parameter P-0-0097, error message **C224 Absolute encoder error** will be generated.

If a "0“ is parametrized in **P-0-0097, Absolute encoder monotoring window**, then this is deactivated.

As a standard value, 0.1 motor rotation (= 36 degrees in reference to the motor shaft) can be programmed if the axis has an electrically released brake or a self braking mechanism.

See also the functional description: "Absolute encoder monitoring"

P-0-0097 - Attributes

Para. Name:	**DE**	Absolutgeber-Überwachungsfenster		
	EN	Absolute encoder monitoring window		
	FR	Fenêtre de surveillance du codeur absolu		
	ES	Ventana de control de encoder absoluto		
	IT	Finestra di Controllo del Encoder assoluto		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		100000	**Cyc. transmittable:**	no

P-0-0098, Max. model deviation

The maximum model deviation is the maximum deviation between the real position feedback value and the model position feedback value calculated by the drive.

This parameter can be read out by the user to help set parameters for **S-0-0159, Monitoring window**.

Two cases must be distinguished for determining the model position feedback value:

1) Position control with following (lag) error

In this operating mode, the controlled system is simulated by a model.

The maximum deviation between the calculated position feedback module value and the real position feedback value is stored in parameter P-0-0098.

The control system model represents a delayed component of the first order, which is dependent only on the Kv factor of the position controller.

2) Position control without following (lag) error

In this operating mode, the position command value is compared to the position feedback value. The maximum deviation encountered is stored in P-0-0098.

A model for the controlled system is not necessary in this case.

Note: This parameter can be write accessed so that it can be set back to 0, for example.

See also the functional description: "Position control loop monitoring".

P-0-0098 - Attributes

Para. Name:	**DE**	Max. Modellabweichung		
	EN	Max. model deviation		
	FR	Ecart maxi. au modèle		
	ES	max. desviacion de modelo		
	IT	Deviazione mass. da Modello		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		0 / S-0-0076		
Default value:		---	**Cyc. transmittable:**	no

P-0-0099, Position command smoothing time constant

The position command smoothing time constant determines the maximum jerk possible with a cyclical position command setting.

The maximum jerk is determined by:

$$\text{max. jerk} = \frac{\text{2nd derivative of the position command values}}{\textbf{P-0-0099 Position command value smoothing filter time constant}}$$

Fig. 3-16: Max. jerk

If S-0-0001, NC Cycle time (TNcyc), is equal or greater than P-0-0099 then no filter is active.

See also the functional description: "Generator Feature: Position Command Value Interpolator"

P-0-0099 - Attributes

Para. Name:	**DE**	Lagesollwert-Glättungsfilter-Zeitkonstante		
	EN	Position command smoothing time constant		
	FR	Constante de temps de filtrage consigne de pos.		
	ES	Posicion comando constante temporal		
	IT	Costante di Tempo per Smorzamento Comandi Posiz.		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

P-0-0109, Torque/force peak limit

The maximum peak torque of a drive can be limited in a manner suitable to an application with the use of parameter P-0-0109, Torque/ force peak limit. In other words, the parameter ensures that the max. torque specific to the application is not exceeded even if **S-0-0092, Bipolar torque/force limit value** is set high.

See function description: "Torque/force limit“.

P-0-0109 - Attributes

Para. Name:	**DE**	Spitzendrehmoment-/Kraft-Begrenzung		
	EN	Torque/force peak limit		
	FR	Limitation courant/force crête		
	ES	Limite par punta/fuerza		
	IT	Limitazione Picco Coppia/Forza		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0086	**Extrem value check:**	yes
Decimal places:		S-0-0086	**Combination check:**	no
Input min/max:		0 / S-0-0086		
Default value:		4000	**Cyc. transmittable:**	no

P-0-0110, Parallel I/O output 2

The control system can use this parameter to address the outputs of the DEA 4.1 I/O card.

See also the functional description: "Digital input/output"

P-0-0110 - Attributes

Para. Name:	**DE**	Paralleler Ausgang 2		
	EN	Parallel I/O output 2		
	FR	Sortie parallèle 2		
	ES	Salida paralela 2		
	IT	Uscite parallele 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffff		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0111, Parallel I/O input 2

The input signals of DEA 5.1 are produced in this parameter.

See also the functional description: "Digital input/output"

P-0-0111 - Attributes

Para. Name:	**DE**	Paralleler Eingang 2		
	EN	Parallel I/O input 2		
	FR	Entrée parallèle 2		
	ES	Entrada paralela 2		
	IT	Ingressi paralleli 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffff		
Default value:		---	**Cyc. transmittable:**	AT

P-0-0112, Parallel I/O output 3

The control system can use this parameter to address the outputs of the DEA 6.1 I/O card.

See also the functional description: "Digital input/output"

P-0-0112 - Attributes

Para. Name:	**DE**	Paralleler Ausgang 3		
	EN	Parallel I/O output 3		
	FR	Sortie parallèle 3		
	ES	Salida paralela 3		
	IT	Uscite parallele 3		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffff		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0113, Parallel I/O input 3

The input signals of DEA 6.1 are produced in this parameter.

See also the functional description: "Digital input/output"

P-0-0113 - Attributes

Para. Name:	**DE**	Paralleler Eingang 3		
	EN	Parallel I/O input 3		
	FR	Entrée parallèle 3		
	ES	Entrada paralela 3		
	IT	Ingressi paralleli 3		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffff		
Default value:		---	**Cyc. transmittable:**	AT

P-0-0117, NC reaction on error

This parameter allows the NC 30 seconds to bring the drive controller to a coordinated deceleration in an error situation if the parameter is set with a "1“. The drive follows the command for this period. The drive reacts with the preset **P-0-0119, Best possible deceleration**.

This feature works for non-fatal errors and interface errors.

Parameter structure:

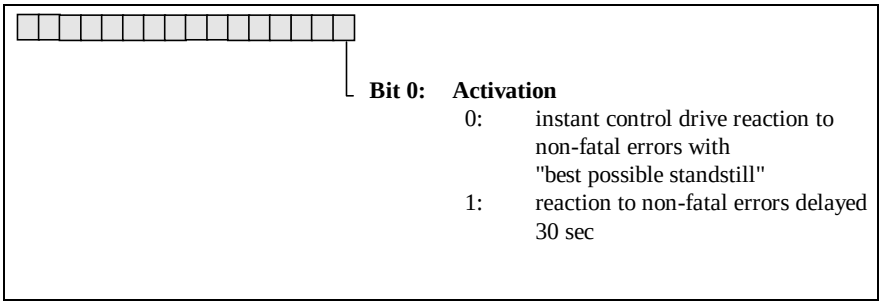
Bit 0: Activation
0: instant control drive reaction to non-fatal errors with "best possible standstill"
1: reaction to non-fatal errors delayed 30 sec

Fig. 3-17: P-0-0117, NC reaction on error

See also the functional description: "NC response in error situation"

P-0-0117 - Attributes

Para. Name:	**DE**	Aktivierung NC-Reaktion im Fehlerfall		
	EN	NC reaction on error		
	FR	Activation réaction CN en cas de défaut		
	ES	Activacion reaccion NC en caso de error		
	IT	Reazione in Presenza Errore NC		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 1		
Default value:		0	**Cyc. transmittable:**	no

P-0-0118, Power off on error

If a Class 1 Diagnostic error is recognized, the drive reacts either with the preset **P-0-0119, Best possible deceleration** or, in the case of a fatal error, with an immediate switch to torque-free state. If this parameter is set to "1", then the X1.2 signal for the supply module will be removed. As a result, the signal and the DC bus voltage will be switched off on all other drives connected to the same supply module. These drives react with their **P-0-0119** preset **Best possible deceleration**.

If power off is set with bit 0 in the event of an error, the bit 2 should be set to 1 in the DKR compact machines. The drive error message causes a mains disconnect and thus the option of feeding the decel energy back into the mains.The drives coast without a bleeder.

With bit 1 it is possible to set when the error message can be removed by the drive from power supply unit for the first time. If this bit is a 1, then the error message is immediataly removed after the basic initialization of the drive making a powering up possible already in communications phase 0.If the bit is 1= 0, then the drive must be in communications phase 4 without an error before the error message to the power supply unit can be removed for the first time.

Bits 3 and 4 offer options for handling undervoltage. There is undervoltage if the drive is enabled (with torque) and the PC bus voltage signal disappears.

Undervoltage can be handled as a "fatal warning“ if bit 3= 1.The drive does not signal a C1D error and **P-0-0119, Best possible decleration** is not executed. The motor is switched off and the DC bus voltage slowly drops. Thus, asynchronous motors can still have a magnetic field when the control starts bringing the drives to an synchronized stand still. Acceleration takes place in generator mode.

If undervoltage is treated as an error, then bit 4 can be used to set an automatic reset of error once the control removes the drive enable. This can be used if the error occus with normal shutdowns as well and this is because the control does not remove the enable quickly enough.

Parameter structure:

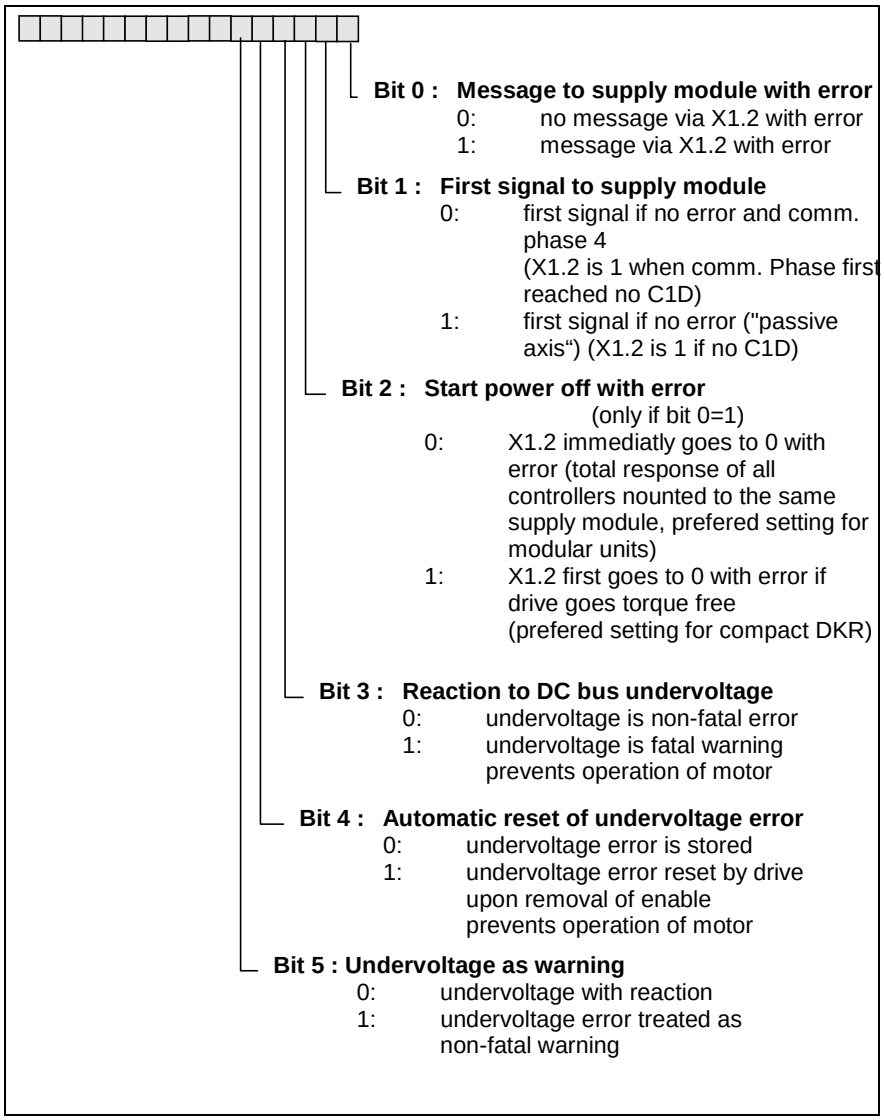
Bit 0 : Message to supply module with error
0: no message via X1.2 with error
1: message via X1.2 with error
Bit 1 : First signal to supply module
0: first signal if no error and comm. phase 4
(X1.2 is 1 when comm. Phase first reached no C1D)
1: first signal if no error ("passive axis“) (X1.2 is 1 if no C1D)
Bit 2 : Start power off with error
(only if bit 0=1)
0: X1.2 immediatly goes to 0 with error (total response of all controllers nounted to the same supply module, prefered setting for modular units)
1: X1.2 first goes to 0 with error if drive goes torque free
(prefered setting for compact DKR)
Bit 3 : Reaction to DC bus undervoltage
0: undervoltage is non-fatal error
1: undervoltage is fatal warning
prevents operation of motor
Bit 4 : Automatic reset of undervoltage error
0: undervoltage error is stored
1: undervoltage error reset by drive upon removal of enable
prevents operation of motor
Bit 5 : Undervoltage as warning
0: undervoltage with reaction
1: undervoltage error treated as non-fatal warning

Fig. 3-18: P-0-0118, Power off on error

See also the functional description: "Power Supply Shutdown in Error Situation"

P-0-0118 - Attributes

Para. Name:	**DE**	Leistungsabschaltung im Fehlerfall		
	EN	Power off on error		
	FR	Mise hors tension en cas de défaut		
	ES	Desconexion de potencia en caso de error		
	IT	Spegnimento Potenza in Caso di Errore		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 31		
Default value:		1	**Cyc. transmittable:**	no

P-0-0119, Best possible deceleration

This parameter specifies the type of braking to a standstill for the drive in the event of

- a non-fatal error
- an interface error
- a phase relapse
- switching off the controller enable signal

P-0-0119:	Reaction mode:
0	Velocity command value set to zero, i.e., the motor brakes in regard to the torque limit value. The **Braking time** is set in parameter **P-0-0126**. 100 milliseconds before the brake time elapses, the blocking brake is activated. If the velocity has previously fallen below 10 rpm (rotational motors) or below 10 mm/min (linear motors), then the blocking brake will be engaged immediately. 100 milliseconds after the mechanical brake is set, the motor is torque free.
1	Switch to torque-free state
2	Velocity command to zero with command ramp and filter The ramp, i.e., the maximum accel is set via **P-0-1201 Ramp 1 pitch**, the jerk filter via **P-0.1222, Velocity command filter**
3	Return motion The drive generates a position command profile for traversing the set path with error in which case a relative path is activated which is defined with **P-0-0096, Distance to move in error situation**, **S-0-0091, Bipolar Velocity Limit Value**, **S-0-0138, Bipolar acceleration limit value** and **S-0-0349, Jerk Limit bipolar**

Fig. 3-19: Deceleration mode for the drive

See also the functional description: "Best Possible Deceleration"

P-0-0119 - Attributes

Para. Name:	**DE**	Bestmögliche Stillsetzung		
	EN	Best possible deceleration		
	FR	Arrêt au plus vite		
	ES	La mejor parada posible		
	IT	Decellerazione massima		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 3		
Default value:		0	**Cyc. transmittable:**	no

P-0-0121, Velocity mixfactor Feedback 1 & 2

The Velocity mix factor parameter determines the relation of the velocity feedback values between the motor encoder and the external encoder.

The input is percentage-based. Note the following:

0 %: The velocity controller works solely with the velocity of the motor encoder (= encoder 1)

100 %: The velocity controller works solely with the velocity of the external encoder (= encoder 2)

If no external encoder is available, then the parameter will be set to 0 %.

See also the functional description: "Setting the velocity mix factor"

P-0-0121 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Mischfaktor Geber 1 & Geber 2		
	EN	Velocity mixfactor Feedback 1 & 2		
	FR	Facteur de mixage vitesse codeur 1 & codeur 2		
	ES	Factor mixto de velocidad encoder 1 & 2		
	IT	Fattore di Correzione Feedback 1 & 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		%	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 100.0		
Default value:		0	**Cyc. transmittable:**	no

P-0-0123, Absolute encoder buffer

All the data that the absolute encoder needs for position initialization is stored in this parameter.

See also the functional description: "Other Settings for Absolute Measurement Systems"

P-0-0123 - Attributes

Para. Name:	**DE**	Absolutgeber-Puffer		
	EN	Absolute encoder buffer		
	FR	Tampon codeur absolu		
	ES	Buffer de encoder absoluto		
	IT	Buffer Encoder assoluto		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0124, Assignment IDN -> DEA-output

This parameter is used to assign a parameter value to a DEA output. If the data capacity of the assigned parameter is greater than that of the DEA port, then the higher-valued bits will be truncated.

Parameter structure:

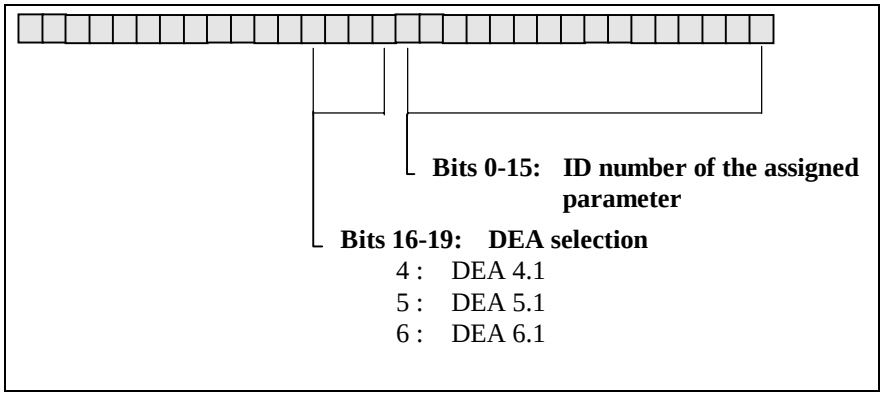

Fig. 3-20: P-0-0124, Assignment IDN -> DEA output

The contents of the parameter are written to the DEA output.

Note: If an ID number is assigned to DEA 4.1, then parameter **P-0-0081, Parallel I/O output 1** can no longer be used.

The same restriction applies to:

- Assignment DEA 5.1 <> **P-0-0110, Parallel I/O output 2**
- Assignment DEA 6.1 <> **P-0-0112, Parallel I/O output 3**

See also the functional description: "Digital input/output"

P-0-0124 - Attributes

Para. Name:	**DE**	Zuweisung Identnummer -> DEA-Ausgang		
	EN	Assignment IDN -> DEA-output		
	FR	Assignation IDN -> sortie DEA		
	ES	Asignacion numero ident -> salida DEA		
	IT	Assegnazione IDN -> DEA Uscite		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0125, Assignment DEA-input -> IDN

This parameter can be used to assign a DEA input to the value of a parameter.

The input status of the DEA is written in the corresponding parameter.

Parameter structure:

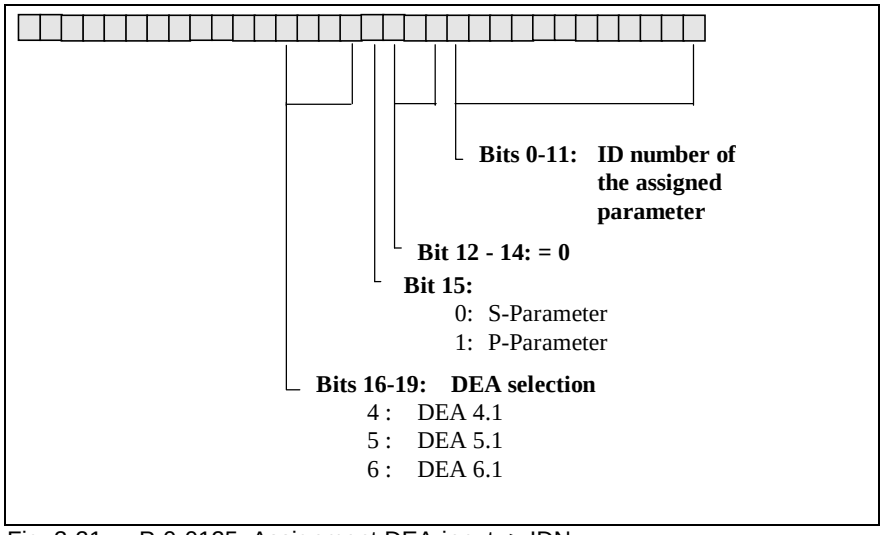
Bits 0-11: ID number of the assigned parameter
Bit 12 - 14: = 0
Bit 15:
0: S-Parameter
1: P-Parameter
Bits 16-19: DEA selection
4 : DEA 4.1
5 : DEA 5.1
6 : DEA 6.1

Fig. 3-21: P-0-0125, Assignment DEA-input -> IDN

Note: If a DEA is assigned an ID number using parameter P-0-0125, then the operating data of the assigned ID number will be cyclically overwritten by the DEA input.

See also the functional description: "Digital input/output"

P-0-0125 - Attributes

Para. Name:	**DE**	Zuweisung DEA-Eingang -> Identnummer		
	EN	Assignment DEA-input -> IDN		
	FR	Assignation entrée DEA -> IDN		
	ES	Asignacion entrada DEA -> Numero de ident		
	IT	Assegnazione Ingressi DEA -> IDN		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0126, Maximum braking time

The maximum braking time for the drive is set in this parameter.

The value should always be set higher then the time needed, considering the maximum possible velocity, to decelerate the shaft using velocity command value zero-switching.

The velocity command value is switched to zero if **P-0-0119, Best possible deceleration** is set to 0 and either:

- The controller enable (RF) is removed
- The drive is switched to Set parameter mode with RF switched on
- A drive error is recognized that still allows a reaction from the drive (all non-fatal errors)
- In the case of separately supplied devices (HDS), a drive connected to the same supply module reports an error to that module, so that the intermediate voltage is switched off.

See also the functional description: "Velocity command value reset“.

P-0-0126 - Attributes

Para. Name:	**DE**	Maximale Bremszeit		
	EN	Maximum braking time		
	FR	Temps de freinage max.		
	ES	Tiempo max. de frenado		
	IT	Tempo massimo di Frenata		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		500 / 100000		
Default value:		10000	**Cyc. transmittable:**	no

P-0-0127, Overload warning

To protect the power stage, the temperature is calculated with a temperature model for the transistor final stage. If the temperature exceeds 125°C, then the torque-producing command current will be limited.

To avoid an unexpected disruption of the torque from the drive, a warning threshold can be set in this parameter.

If the thermal load rises above the set value, warning **E261 Continuous current limiting prewarning** will be generated.

If 100% is entered, this warning will be deactivated since then the message **E257 Continuous current limit active** will be generated.

See also the functional description: "Monitoring the thermal load"

P-0-0127 - Attributes

Para. Name:	**DE**	Überlastwarnung		
	EN	Overload warning		
	FR	Alerte surcharge		
	ES	Aviso de sobrecarga		
	IT	Preallarme Sovracarico		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		%	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		00000 / 100		
Default value:		80	**Cyc. transmittable:**	no

P-0-0139, Analog output 1

Parameter **P-0-0139, Analog output 1** sets the voltage value given to the drive controller via analog output 1. It can be directly write accessed intervally by selecting a signal via **P-0-0420, Analog output 1 signal selectior** and **P-0-0421, Analog output 1, expanded signal selection** or by the control. The voltage value output is quantizied with 78mV.

See also the functional description: "Analog Output"

P-0-0139 - Attributes

Para. Name:	**DE**	Analogausgang 1		
	EN	Analog output 1		
	FR	Sortie analogique 1		
	ES	Salida analogica 1		
	IT	Uscita analogica 1		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		V	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		-10000 / 10000		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0140, Analog output 2

Parameter **P-0-0140, Analog output 2** sets the voltage value given to the drive controller via analog output 2. It can be directly write accessed intervally by selecting a signal via **P-0-0423, Analog output 2 signal selectior** and **P-0-0424, Analog output 2, expanded signal selection** or by the control. The voltage value output is quantizied with 78mV.

See also the functional description: "Analog Output"

P-0-0140 - Attributes

Para. Name:	**DE**	Analogausgang 2		
	EN	Analog output 2		
	FR	Sortie analogique 2		
	ES	Salida analogica 2		
	IT	Uscita analogica 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		V	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		-10000 / 10000		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0141, Thermal drive load

The parameter P-0-0141, Thermal drive load is for diagnostic purposes. In this parameter, 0% corresponds to a chip over-temperature of 0 Kelvin, 100% corresponds to the maximum chip over-temperature. The thermal load should not exceed a value of 80% for the applied operating cycles if the drive is set up correctly.It typically takes about 10 minutes to warm up a drive controller end stage to its final temperature. To check the thermal load of a drive during installation without having to run operating cycles during this period of time, the drive controller load can be preset with 80%. This can happen by writing an arbitrary value to the parameter **P-0-0141, Thermal drive load**.

See also the functional description: "Checking the thermal load"

P-0-0141 - Attributes

Para. Name:	**DE**	Thermische Regelgeräte-Auslastung		
	EN	Thermal drive load		
	FR	Charge thermique variateur		
	ES	Descarga termica de reguladores		
	IT	Carico termico Azionamento		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		%	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		00000 / 100		
Default value:		---	**Cyc. transmittable:**	no

P-0-0145, Expanded trigger level

This parameter is for service purposes only.

If bit 12, Expanded trigger level is selected using parameter **P-0-0026, Trigger signal selection**, then an address can be selected with parameter P-0-0145 that is monitored for the threshold parameter value.

Parameter structure:

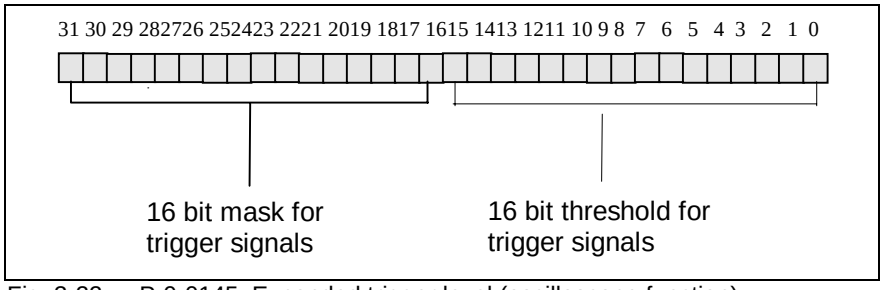

Fig. 3-22: P-0-0145, Expanded trigger level (oscilloscope function)

See also the functional description: "Oscilloscope feature"

P-0-0145 - Attributes

Para. Name:	**DE**	Triggerschwelle erw.Oszilloskopfunktion		
	EN	Expanded trigger level		
	FR	Seuil de déclenchement fonction oscill. élargie		
	ES	Umbral de trigger funcion ampliada de osciloscopio		
	IT	Superamento Soglia Fronte di Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0146, Expanded trigger address

This parameter is for service purposes only.

If bit 12 Expanded trigger level is selected in using parameter **P-0-0026, Trigger signal selection**, then an address can be selected with parameter P-0-0146 that is monitored for the threshold parameter value.

Parameter structure:

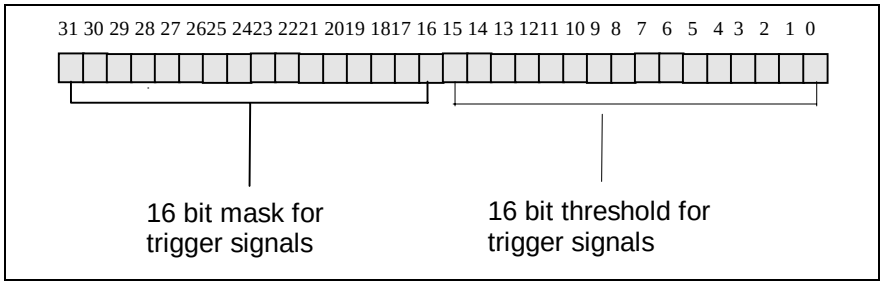

Fig. 3-23: P-0-0146, Expanded trigger address

The 16-bit value of the trigger edge is monitored, and the trigger signal will have been previous ANDed via the mask for trigger signals.

See also the functional description: "Oscilloscope feature"

P-0-0146 - Attributes

Para. Name:	**DE**	Triggersignaladresse erw. Oszilloskopfunktion		
	EN	Expanded trigger address		
	FR	Adresse déclenchement fonction ocill. élargie		
	ES	Direccion de trigger funcion de osciloscopio ampliada		
	IT	Superamento Indirizzo del Segnale di Trigger		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0147, Expanded signal K1 address

If an expanded signal selection is made with parameters **P-0-0023, Signal select scope channel 1** and **P-0-0024, Signal select scope channel 2**, then an address to be recorded can be chosen in the drive with parameter P-0-0147.

See also the functional description: "Oscilloscope feature"

P-0-0147 - Attributes

Para. Name:	**DE**	Signaladresse K1 erw. Oszilloskopfunktion		
	EN	Expanded signal K1 address		
	FR	Adresse signal K1 fonction oscill. élargie		
	ES	Direccion de señal K1 funcion de osciloscopio ampliada		
	IT	Indirizzo Segnale K1		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0148, Expanded signal K2 address

If an expanded signal selection is chosen with parameters **P-0-0023, Signal select scope channel 1** and **P-0-0024, Signal select scope channel 2**, then an address to be recorded can be chosen in the drive with parameter P-0-0148.

See also the functional description: "Oscilloscope feature"

P-0-0148 - Attributes

Para. Name:	**DE**	Signaladresse K2 erw. Oszilloskopfunktion		
	EN	Expanded signal K2 address		
	FR	Adresse signal K2 fonction oscill. élargie		
	ES	Direccion de señal K2 funcion de osciloscopio ampliada		
	IT	Indirizzo Segnale K2		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0149, List of selectable signals for oscilloscope function

The control system can read drive-supported, defined signals with parameter P-0-0149.This permits a user interface to prepare a signal select menu using the informationin the listed parameters in the drive.

List entries:	ID number of:
1	S-0-0051 or S-0-0053
2	S-0-0040
3	S-0-0347
4	S-0-0189
5	S-0-0080
6	P-0-0147
7	P-0-0148

Fig. 3-24: P-0-0149, List of selectable signals for oscilloscope function

See also the functional description: "Oscilloscope feature"

P-0-0149 - Attributes

Para. Name:	**DE**	Signalauswahlliste für Oszilloskopfunktion		
	EN	List of selectable signals for oscilloscope function		
	FR	Liste sélection signaux pour fonction oscilloscope		
	ES	Lista de seleccion de señal para funcion de osciloscopio		
	IT	Lista dei Segnali validi per Funzione Oscilloscopio		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0150, Number of valid samples for oscilloscope function

If the oscilloscope function is activated then the signal to be recorded is continously fed to a value memory. If triggering occurs, then the recording procedure is stored and the value list can be read out. The oldest measured value is the first element of this list, the newest value the last. If triggering occurs before the memory is completely filled, then a number of values at the start of the list are invalid.The number of valid values before triggering is available in parameter **P-0-0150, Number of valid samples for oscilloscope function**.

See also the functional description: "Oscilloscope feature"

P-0-0150 - Attributes

Para. Name:	**DE**	Anzahl gültiger Messwerte für Oszilloskopfunktion
	EN	Number of valid samples for oscilloscope function
	FR	Nombre de mesures valides pour fonction oscilloscope
	ES	Numero de valores de medicion validos para funcion oscilosco
	IT	Numero dei Campionamenti validi per Funz. Oscill.

Function:	Parameter	**Editability:**	no
Data length:	2Byte	**Memory:**	no
Format:	DEC_OV	**Validity check:**	no
Unit:	--	**Extrem value check:**	no
Decimal places:	0	**Combination check:**	no
Input min/max:	--- / ---		
Default value:	---	**Cyc. transmittable:**	no

P-0-0153, Optimal distance home switch - reference mark

During command "**Drive-controlled homing**" when the zero-switch and homing mark evaluation are activated, the distance between the zero-switch edge and the homing mark is monitored. For reference marks (home reference) with equal intervals, the optimal distance is half the home-reference interval. The optimal distance can be entered in parameter P-0-0153, Optimal distance home switch - reference mark as per the following table:

Encoder type	P-0-0153	Function
Rotational	0	The zero-switch - reference mark interval is monitored. The optimal distance will be calculated internally, and is equal to 1/2 of an encoder revolution for DSF or incr. rotary encoders, or 1/2 of an encoder revolution / **S-0-0116, Rotary encoder resolution - 1** for resolvers.
Rotational	x	The zero-switch - reference mark interval is monitored. Half the reference mark distance must be entered in **P-0-0153, Optimal distance home switch - reference mark**.
Linear	0	The zero-switch - reference mark interval is not monitored. The linear encoder does not affect reference marks with constant intervals. The real distance between the zero-switch and the reference mark must be large enough to ensure recognition of the zero-switch edge, taking into account the maximum homing velocity and the cycle time for the zero-switch input request.
Linear	x	The zero-switch - reference mark interval is monitored. Half the reference mark distance must be entered in **P-0-0153, Optimal distance home switch - reference mark**.

Fig. 3-25: Interval monitoring, home switch - reference mark

See also the functional description: "Drive-controlled homing"

P-0-0153 - Attributes

Para. Name:	**DE**	Optimaler Abstand Nullschalter-Referenzmarke		
	EN	Optimal distance home switch - reference mark		
	FR	Distance optimale entre contact d'origine et marque de réf.		
	ES	Distancia optima marca de puesta a cero		
	IT	Distanza ottimale Camma di Zero		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		S-0-0076	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		S-0-0076 / S-0-0076		
Default value:		0	**Cyc. transmittable:**	no

P-0-0170, Parallel I/O output 4

Parameter **P-0-0170, Parallel I/O Output 4** displayes the parallel outputs of the DEA. 8.1 I/O module which can adress the outputs of this module.

See also the functional description: "Digital Input/Output“

P-0-0170 - Attributes

Para. Name:	**DE**	Paralleler Ausgang 4		
	EN	Parallel I/O output 4		
	FR	Sortie parallèle 4		
	ES	Salida paralela 4		
	IT	Uscita parallela 4		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffffffff		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0171, Parallel I/O input 4

Parameter **P-0-0171, Parallel I/O Input 4** displayes the parallel inputs of the DEA. 5.1 I/O module which can adress the inputs of this module.

See also the functional description: "Digital Input/Output“

P-0-0171 - Attributes

Para. Name:	**DE**	Paralleler Eingang 4		
	EN	Parallel I/O input 4		
	FR	Entrée parallele 4		
	ES	Entrada paralela 4		
	IT	Ingressi paralleli 4		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffffffff		
Default value:		---	**Cyc. transmittable:**	AT

P-0-0172, Parallel I/O output 5

Parameter **P-0-0172, Parallel I/O Output 5** displayes the parallel outputs of the DEA. 9.1 I/O module which can adress the outputs of this module.

See also the functional description: "Digital Input/Output“

P-0-0172 - Attributes

Para. Name:	**DE**	Paralleler Ausgang 5		
	EN	Parallel I/O output 5		
	FR	Sortie parallèle 5		
	ES	Salida paralela 5		
	IT	Uscita parallela 5		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffffffff		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0173, Parallel I/O input 5

Parameter **P-0-0173, Parallel I/O Input 5** displayes the parallel inputs of the DEA. 5.1 I/O module which can adress the inputs of this module.

See also the functional description: "Digital Input/Output“

P-0-0173 - Attributes

Para. Name:	**DE**	Paralleler Eingang 5		
	EN	Parallel I/O input 5		
	FR	Entrée parallèle 5		
	ES	Entrada paralela 5		
	IT	Ingressi paralleli 5		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffffffff		
Default value:		---	**Cyc. transmittable:**	AT

P-0-0174, Parallel I/O output 6

Parameter **P-0-0174, Parallel I/O Output 6** displayes the parallel outputs of the DEA. 10.1 I/O module which can adress the outputs of this module.

See also the functional description: "Digital Input/Output“

P-0-0174 - Attributes

Para. Name:	**DE**	Paralleler Ausgang 6		
	EN	Parallel I/O output 6		
	FR	Sortie parallèle 6		
	ES	Salida paralela 6		
	IT	Uscita parallela 6		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffffffff		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0175, Parallel I/O input 6

Parameter **P-0-0175, Parallel I/O Input 6** displayes the parallel inputs of the DEA. 10.1 I/O module which can adress the inputs of this module.

See also the functional description: "Digital Input/Output“

P-0-0175 - Attributes

Para. Name:	**DE**	Paralleler Eingang 6		
	EN	Parallel I/O input 6		
	FR	Entrée parallèle 6		
	ES	Entrada paralela 6		
	IT	Ingressi paralleli 6		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		HEX	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 0xffffffff		
Default value:		---	**Cyc. transmittable:**	AT

P-0-0180, Rejection frequency velocity loop

To supress the mechanical resonance frequency a band filter can be activated at the output of the relocity controler .It is parametrized with parameters **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop**.

P-0-0180, Rejection frequency velocity loop indicates the frequency most attenuated.

See also the functional description: "Filtering oscillations from mechanical resonance"

P-0-0180 - Attributes

Para. Name:	**DE**	Sperrfrequenz Geschwindigkeitsregler		
	EN	Rejection frequency velocity loop		
	FR	Fréquence á supprimer, boucle de vitesse		
	ES	Frecuencia a eliminar Regulador de velocidad		
	IT	Frequenza da sopprimere, Anello di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Hz	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		00150 / 1950		
Default value:		1900	**Cyc. transmittable:**	no

P-0-0181, Rejection bandwidth velocity loop

To supress the mechanical resonance frequency a band filter can be activated at the output of the relocity controler. It is parametrized with parameters **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop**.

P-0-0181, Rejection bandwidth velocity loop sets the frequency range for the locking frequency with an attenuation smaller than -3dB.

Example : P-0-0180 = 500 Hz,

P-0-0181 = 200 Hz,

then : attenuation<-3dB in range of 400..600 Hz

See also the functional description: "Filtering oscillations from mechanical resonance"

P-0-0181 - Attributes

Para. Name:	**DE**	Bandbreite Sperrfilter Geschwindigkeitsregler		
	EN	Rejection bandwidth velocity loop		
	FR	Gamme de bande à supprimer, boucle de vitesse		
	ES	Ancho de banda a eliminar regulador de velocidad		
	IT	Larghezza Banda da sopprimere, Anello di Velocità		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Hz	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 3900		
Default value:		0	**Cyc. transmittable:**	no

P-0-0185, Function of ext. encoder

Parameter P-0-0185 can be used to allocate a specific function to an external encoder. The following functions are defined:

Contents of P-0-0185	Ext. encoder function
0	ext. control function
2	Lod side motor enc.

Fig. 3-27: Ext. encoder Function

Explanation:

- If the ext. encoder is used as a control encoder, then it can be used to close the control loop. All modes are possible with ext. enc. The position value is set in **S-0-0053, Position feedback value 2 (ext. feedback)**
- If the ext. enc. is used as a motor enc., then the control loop and commutation are generated via this encoder. Only **S-0-0053, Position feedback value 2 (ext. feedback)** is supported.

See also the functional description: "External encoder"

P-0-0185 - Attributes

Para. Name:	**DE**	Funktion des ext. Gebers		
	EN	Function of ext. encoder		
	FR	Fonction du codeur externe		
	ES	Función del encoder externo		
	IT	Funzione del Encoder esterno		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-0190, Operating hours control section

The operating hours of the control section are displayed here. With this parameter, the entire on time of control electronics since installation of the unit can be displayed. If C1D occurs, then the contents of this parameter at that time is first stored in **P-0-0193, Error recorder, operating hours control section**.

See also the functional description: "Error memory and operating hour counter"

P-0-0190 - Attributes

Para. Name:	**DE**	Betriebsstunden Steuerteil		
	EN	Operating hours control section		
	FR	Heures de fonctionnement contrôle		
	ES	Horas de servicio sesión de control		
	IT	Ore d'Operazione Sezione Controllo		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		h	**Extrem value check:**	no
Decimal places:		4	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0191, Operating hours power section

With this parameter, the entire on time of control electronics since installation of the unit can be displayed. This is the time over which the drive was operated with control enable on.

See also the functional description: "Error memory and operating hour counter"

P-0-0191 - Attributes

Para. Name:	**DE**	Betriebsstunden Leistungsteil		
	EN	Operating hours power section		
	FR	Heures de fonctionnnement puissance		
	ES	Horas de servicio parte de potencia		
	IT	Ore d'Operazione Sezione Potenza		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		h	**Extrem value check:**	no
Decimal places:		4	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0192, Error recorder, diagnosis number

If the drive diagnosis a C1D, then a bit is set in **S-0-0011, Class 1 diagnostics** C1D. Bit 13 for "Error C1D“ is set in the drive status word.

Additionally for a precise diagnosis:

- the diagnosis number is shown in the 7- segment display and stored in **S-0-0390, Diagnostic message number**,
- the clear text diagnosis is stored in **S-0-0095, Diagnostic message**,
- and the relevant error number in **P-0-0009, Error message number**.

If the error is reset, then the diagnosis number of the error displayed **in S-0-0390, Diagnostic message number** is stored in **P-0-0192, Error recorder diagnosis number**. This parameter shows the diagnosis numbers of the last 19 errors in chronological order. The last error is first.

The status of **P-0-0190, Operating hours control section** at the time the error was detected is srored in **P-0-0193, Error recorder, operating hours control section**.

See also the functional description: "Error memory and operating hour counter"

P-0-0192 - Attributes

Para. Name:	**DE**	Fehlerspeicher Diagnosenummer		
	EN	Error recorder, diagnosis number		
	FR	Enregistrement d'erreurs, numéros de diagnostique		
	ES	Memoria de errores número de diagnóstico		
	IT	Memoria dei Guasti, Numeri Diagnosi		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0193, Error recorder, operating hours control section

If the drive diagnosis a C1D, then a bit is set in **S-0-0011, Class 1 diagnostics** C1D. Bit 13 for "Error C1D“ is set in the drive status word.

Additionally for a precise diagnosis:

- the diagnosis number is shown in the 7- segment display and stored in **S-0-0390, Diagnostic message number**,
- the clear text diagnosis is stored in **S-0-0095, Diagnostic message**,
- and the relevant error number in **P-0-0009, Error message number**.

If the error is reset, then the status of **P-0-0190, Operating hours control section** at the time the error was detected is srored in **P-0-0193, Error recorder, operating hours control section**. This parameter shows the diagnosis numbers of the last 19 errors in chronological order. The last error is first

The status of **P-0-0192, Error recorder diagnosis number** at the time the error was detected in the order in **S-0-0390, Diagnostic message number**.

See also the functional description: "Error memory and operating hour counter"

P-0-0193 - Attributes

Para. Name:	**DE**	Fehlerspeicher Betriebstunden Steuerteil		
	EN	Error recorder, operating hours control section		
	FR	Enregistrement d'erreurs, heures de fonctionnement cont.		
	ES	Memoria de errores horas de servicio parte de control		
	IT	Memoria dei Guasti, Ore d'Operazione		
Function:		Parameter	**Editability:**	no
Data length:		4Byte variabel	**Memory:**	Verst. EE
Format:		HEX	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0200, Signal select probe 1

This parameter is used to select what measured quantity will be used for probe input 2.

The following signals can be selected:

P-0-0200:	Selected signal:
0	Position feedback value 1 or 2, dependent on **S-0-0169, Probe control parameter** bit 4
1	Time measurement in µs

Fig. 3-28: P-0-0200, Signal select probe 1

See also the functional description: "Probe Input Feature"

P-0-0200 - Attributes

Para. Name:	**DE**	Signal-Auswahl Messtaster 1		
	EN	Signal select probe 1		
	FR	Sélection signal pour sonde 1		
	ES	Seleccion de señal muestra 1		
	IT	Selezione Segnale Probe 1		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 4		
Default value:		0	**Cyc. transmittable:**	no

P-0-0201, Signal select probe 2

This parameter is used to select what measured quantity will be used for probe input 2.

The following signals can be selected:

P-0-0201:	Selected signal:
0	Position feedback value 1 or 2, dependent on **S-0-0169, Probe control parameter** bit 4
1	Time measurement in µs

Fig. 3-29: P-0-0201, Signal select probe 2

See also the functional description: "Probe Input Feature"

P-0-0201 - Attributes

Para. Name:	**DE**	Signal-Auswahl Messtaster 2		
	EN	Signal select probe 2		
	FR	Sélection signal pour sonde 2		
	ES	Seleccion de señal muestra 2		
	IT	Selezione Segnale Probe 2		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 2		
Default value:		0	**Cyc. transmittable:**	no

P-0-0202, Difference probe values 1

The difference between the positive probe value and the negative probe value of probe 1 is stored in this parameter. The value is always recalculated when a new positive or negative probe value is latched.

See also the functional description: "Probe Input Feature"

P-0-0202 - Attributes

Para. Name:	**DE**	Differenz Messwerte 1		
	EN	Difference probe values 1		
	FR	Différence mesure 1		
	ES	Diferencia valores de medicion 1		
	IT	Differenza Valore Misurato 1		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0200	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0200	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

P-0-0203, Difference probe values 2

The difference between the positive probe value and the negative probe value of probe 2 is stored in this parameter. The value is always recalculated when a new positive or negative probe value is latched.

See also the functional description: "Probe Input Feature"

P-0-0203 - Attributes

Para. Name:	**DE**	Differenz Messwerte 2		
	EN	Difference probe values 2		
	FR	Différence mesure 2		
	ES	Diferencia valores de medicion 2		
	IT	Differenza Valore Misurato 2		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		S-0-0076/P-0-0200	**Extrem value check:**	no
Decimal places:		S-0-0076/P-0-0200	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	AT

P-0-0210, Analog input 1

The analog voltage can be read in volts with 3 decimal places applied at the DAE02.1 analog channel 1 (E1+,E1-) via this parameter.

See also the functional description: "Analog Inputs"

P-0-0210 - Attributes

Para. Name:	**DE**	Analog-Eingang 1		
	EN	Analog input 1		
	FR	Entrée analogique 1		
	ES	Entrada analogica 1		
	IT	Ingresso analogico 1		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		V	**Extrem value check:**	no
Decimal places:		3	**Combination check:**	no
Input min/max:		-- / --		
Default value:		---	**Cyc. transmittable:**	no

P-0-0211, Analog input 2

The analog voltage can be read in volts with 3 decimal places applied at the DAE02.1 analog channel 2 (E2+,E2-) via this parameter.

See also the functional description: "Analog Inputs"

P-0-0211 - Attributes

Para. Name:	**DE**	Analog-Eingang 2		
	EN	Analog input 2		
	FR	Entrée analogique 2		
	ES	Entrada analogica 2		
	IT	Ingresso analogico 2		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		V	**Extrem value check:**	no
Decimal places:		3	**Combination check:**	no
Input min/max:		-- / --		
Default value:		---	**Cyc. transmittable:**	no

P-0-0212, Analog inputs, IDN list of assignable parameters

The digitalized values of both analog inputs of the DEA02.1 module are stored in **P-0-0210, Analog input 1** and **P-0-0211, Analog input 2**. These can be allocated via settable scaling to other drive parameters or cyclically copied. The allowable parameters for allocation are listed in **P-0-0212, Analog inputs, IDN list of assignable parameters.**

See also the functional description: "Analog Inputs"

P-0-0212 - Attributes

Para. Name:	**DE**	Analog-Eingänge, IDN-Liste der zuweisbaren Parameter		
	EN	Analog inputs, IDN list of assignable parameters		
	FR	Entrées analogiques, liste des param.s pouvant être assignés		
	ES	Entradas analógicas, lista IDN de parámetros asignables		
	IT	Ingressi analogichi, Lista dei Parametri assignabili		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		-- / --		
Default value:		---	**Cyc. transmittable:**	no

P-0-0213, Analog input 1, assignment

The digitalized values of both analog inputs of the DEA02.1 module are stored in **P-0-0210, Analog input 1** and **P-0-0211, Analog input 2**. These can be allocated via settable scaling to other drive parameters or cyclically copied.

To copy cyclically analog input one to a drive parameter the ID no. of this parameter must be entered.

If the ID no. Entered in **P-0-0213, Analog input 1, assignment** not in **P-0-0212, Analog inputs, IDN list of assignable parameters**, then the service channel error message „data not correct“ is generated.

If the allocation is to be deleted, the enter ID no. S-0-0000.

See also the functional description: "Analog Inputs"

P-0-0213 - Attributes

Para. Name:	**DE**	Analog-Eingang 1, Zuweisung		
	EN	Analog input 1, assignment		
	FR	Entrée analogique 1, Assignation		
	ES	Entrada analógica 1, asignación		
	IT	Ingresso analogico 1, Assignazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0214, Analog input 1, scaling per 10V full scale

The digitalized values of both analog inputs of the DEA02.1 module are stored in **P-0-0210, Analog input 1** and **P-0-0211, Analog input 2**. These can be assigned to other drive parameters via settable scalings, i.e., copied.

If analog input 1 is cyclically copied to adrive parameter, i.e., an ID no. Has been entered in **P-0-0213, Analog input 1, assignment**, then avalue of 10V of the analog voltage in terms of the assigned parameter is entered.

The unit and the number of decimal places of **P-0-0214, Analog input 1, scaling per 10V full scale** correspond to those of **P-0-0213, Analog input 1, assignment**.When inputting **P-0-0213, Analog input 1, assignment**, both unit and decimal places of **P-0-0214, Analog input 1, scaling per 10V full scale** are appropriately switched.

See also the functional description: "Analog Inputs"

P-0-0214 - Attributes

Para. Name:	**DE**	Analog-Eingang 1, Bewertung pro 10V		
	EN	Analog input 1, scaling per 10V full scale		
	FR	Entrée analogique 1, Calibrage pour 10V		
	ES	Entrada analógica 1, calibrado		
	IT	Ingresso analogico 1, Scala per 10V		
Function:		Parameter	**Editability:**	P23
Data length:		---	**Memory:**	Param. EE
Format:		---	**Validity check:**	no
Unit:		---	**Extrem value check:**	no
Decimal places:		---	**Combination check:**	no
Input min/max:		0 / 2147483647		
Default value:		1000	**Cyc. transmittable:**	no

P-0-0215, Analog input 2, assignment

The digitalized values of both analog inputs of the DEA02.1 module are stored in **P-0-0210, Analog input 1** and **P-0-0211, Analog input 2**. These can be allocated via settable scaling to other drive parameters or cyclically copied.

The parameter in the **P-0-0212, Analog inputs, IDN list of assignable parameters**, which is to be manipulated via analog channel 2 of the DAE02.1, is assigned to this parameter.If the function of the free assignable analog channels is not needed for channel 2, then S-0-0000 should be entered here to switch the function off and make operating time available for other functions.

See also the functional description: "Analog Inputs"

P-0-0215 - Attributes

Para. Name:	**DE**	Analog-Eingang 2, Zuweisung		
	EN	Analog input 2, assignment		
	FR	Entrée analogique 2, Assignation		
	ES	Entrada analógica 2, asignación		
	IT	Ingresso analogico 1, Assignazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	no
Unit:		---	**Extrem value check:**	no
Decimal places:		---	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0216, Analog input 2, scaling per 10V full scale

The digitalized values of both analog inputs of the DEA02.1 module are stored in **P-0-0210, Analog input 1** and **P-0-0211, Analog input 2**. These can be assigned to other drive parameters via settable scalings, i.e., copied.

If analog input 1 is cyclically copied to a drive parameter, i.e., an ID no. Has been entered in **P-0-0215, Analog input 2, assignment**, then avalue of 10V of the analog voltage in terms of the assigned parameter is entered.

The unit and the number of decimal places of **P-0-0216, Analog input 2, scaling per 10V full scale** correspond to those of **P-0-0215, Analog input 2, assignment**. When inputting **P-0-0215, Analog input 2, assignment**, both unit and decimal places of **P-0-0216, Analog input 2, scaling per 10V full scale** are appropriately switched.

See also the functional description: "Analog Inputs"

P-0-0216 - Attributes

Para. Name:	**DE**	Analog-Eingang 2, Bewertung pro 10V		
	EN	Analog input 2, scaling per 10V full scale		
	FR	Entrée analogique 2, Calibrage pour 10V		
	ES	Entrada analógica 2, calibrado		
	IT	Ingresso analogico 1, Scala per 10V		
Function:		Parameter	**Editability:**	P23
Data length:		---	**Memory:**	Param. EE
Format:		---	**Validity check:**	no
Unit:		---	**Extrem value check:**	no
Decimal places:		---	**Combination check:**	no
Input min/max:		0 / 2147483647		
Default value:		1000	**Cyc. transmittable:**	no

P-0-0217, Analog input 1, offset

The analog channels can be processed with an offset. It is substracted.

See also the functional description: "Analog Inputs"

P-0-0217 - Attributes

Para. Name:	**DE**	Analog-Eingang 1, Offset		
	EN	Analog input 1, offset		
	FR	Entrée analogique 1, offset		
	ES	Entrada analogica 1, offset		
	IT	Ingresso analogico 1, Offset		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		V	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		-10000 / 10000		
Default value:		0	**Cyc. transmittable:**	no

P-0-0218, Analog input 2, offset

The analog channels can be processed with an offset. Actual unit is millivolt and this value will be substracted from the analog command value.

See also the functional description: "Analog Inputs"

P-0-0218 - Attributes

Para. Name:	**DE**	Analog-Eingang 2, Offset		
	EN	Analog input 2, offset		
	FR	Entrée analogique 2, offset		
	ES	Entrada analogica 2, offset		
	IT	Ingresso analogico 2, Offset		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		V	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		-10000 / 10000		
Default value:		0	**Cyc. transmittable:**	no

P-0-0400, Pos. corr., external correction value

The control system can use parameter **P-0-0400, Pos. corr., external correction value** to assign correction values directly for the encoder specified by **S-0-0147, Homing parameter**. The correction value set in the parameter will be added to the appropriate actual feedback value.

See also the functional description: "Axis error correction"

P-0-0400 - Attributes

Para. Name:	**DE**	Pos.-Korr., Korrekturwert extern		
	EN	Pos. corr., external correction value		
	FR	Corr. de pos., valeur externe de correction		
	ES	Correccion de posicion, valor de correccion externo		
	IT	Correzione Valore esterna		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	no
Format:		S-0-0076	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-2147483648 / 2147483647		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0401, Pos. corr., active correction value

Parameter **P-0-0401, Pos. corr., active correction value** indicates the correction value used to correct the encoder defined with **S-0-0147, Homing parameter**. It contains the sum of the correction values from the various correction functions.

See also the functional description: "Axis error correction"

P-0-0401 - Attributes

Para. Name:	**DE**	Pos.-Korr., aktiver Korrekturwert		
	EN	Pos. corr., active correction value		
	FR	Corr. de pos., valeur active de correction		
	ES	Correccion de posicion, valor de correccion interno		
	IT	Correzione Valore interna		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		S-0-0076	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-2147483648 / 2147483647		
Default value:		---	**Cyc. transmittable:**	no

P-0-0402, Pos. corr., reference temperature

Parameter **P-0-0402, Pos. corr., reference temperature** is required for temperature-dependent correction functions. It defines the temperature reference point for determining the portion of the correction value that is temperature-dependent.

See also the functional description: "Axis error correction"

P-0-0402 - Attributes

Para. Name:	**DE**	Pos.-Korr., Bezugstemperatur		
	EN	Pos. corr., reference temperature		
	FR	Corr. de pos., température de réf.		
	ES	Temperatura de referencia		
	IT	Temperatura di Riferimento		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase 3
Unit:		C	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		-20.0 / 200.0		
Default value:		0	**Cyc. transmittable:**	no

P-0-0403, Pos. corr., reference position for temperature correction

Parameter **P-0-0403, Pos. corr., reference position for temperature correction** defines the position at which the correction value for position-dependent temperature correction is zero. It can be determined by measurement of the axis.

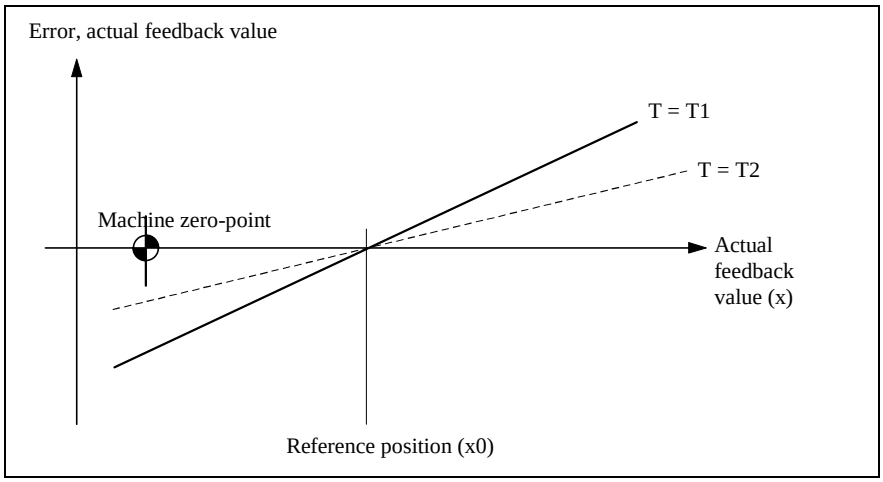

Fig. 3-30: Definition of the reference position

See also the functional description: "Axis error correction"

P-0-0403 - Attributes

Para. Name:	**DE**	Pos.-Korr., Bezugsposition für Temp.-korrektur		
	EN	Pos. corr., reference position for temperature correction		
	FR	Corr. de pos., pos. de réf. pour comp. de température		
	ES	Correccion posicion, posicion de referencia correccion temp.		
	IT	Posizione di Riferimento per Corr. Temperatura		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		S-0-0076	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-2147483648 / 2147483647		
Default value:		0	**Cyc. transmittable:**	no

P-0-0404, Pos. corr., actual temperature, position dependent

If position-dependent correction has been selected, parameter **P-0-0404, Pos. corr., actual temperature, position dependent** defines the current temperature of the hardware to be corrected. It must be transmitted to the drive by the control system.

See also the functional description: "Axis error correction"

P-0-0404 - Attributes

Para. Name:	**DE**	Pos.-Korr., Isttemperatur pos.abh.		
	EN	Pos. corr., actual temperature, position dependent		
	FR	Corr. de pos., température réelle dépendante de la pos.		
	ES	Correccion de pos., temperatura real depend. de pos.		
	IT	Corr. Pos., Temperatura att. dipendente della Pos.		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		C	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		-20.0 / 200.0		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0405, Pos. corr., actual temperature, position independent

If position-independent correction has been selected, parameter **P-0-0405, Pos. corr., actual temperature, position independent** defines the current temperature of the hardware to be corrected. It must be transmitted to the drive by the control system.

See also the functional description: "Axis error correction"

P-0-0405 - Attributes

Para. Name:	**DE**	Pos.-Korr., Isttemperatur pos.unabh.		
	EN	Pos. corr., actual temperature, position independent		
	FR	Corr. de pos., température réelle indépendante de la pos.		
	ES	Correccion de pos., temperatura real independ. de pos.		
	IT	Corr. Pos., Temperatura att. indipendente della Pos.		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		C	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		-20.0 / 200.0		
Default value:		---	**Cyc. transmittable:**	MDT

P-0-0406, Pos. corr., temperature factor position dependent

Parameter **P-0-0406, Pos. corr., temperature factor position dependent** defines the coefficient of linear expansion of the hardware to be corrected with a position-dependent correction function. It can be derived from standard reference tables or direct measurement.

See also the functional description: "Axis error correction"

P-0-0406 - Attributes

Para. Name:	**DE**	Pos.-Korr., Temp.-faktor pos.abh.		
	EN	Pos. corr., temperature factor position dependent		
	FR	Corr. de pos., facteur de température dépendant de la pos.		
	ES	Correccion de pos., factor de temp. depend. de pos.		
	IT	Corr. Pos., Fattore termico dipendente della Pos.		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		1/K	**Extrem value check:**	no
Decimal places:		5	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

P-0-0407, Pos. corr., temperature factor position independent [0.1/K]

Parameter **P-0-0407, Pos. corr., temperature factor position independent [0.1/K]** defines the coefficient of linear expansion for the hardware to be corrected with position-independent correction function. In specifying the coefficient, the length of the hardware to be corrected must be taken into account.

See also the functional description: "Axis error correction"

P-0-0407 - Attributes

Para. Name:	**DE**	Pos.-Korr., Temp.-faktor pos.unabh.[0.1/K]		
	EN	Pos. corr., temperature factor position independent [0.1/K]		
	FR	Corr. de pos., facteur de température indép. de pos.[0.1/K]		
	ES	Correccion de pos., factor de temp. indep. de pos.[0.1/K]		
	IT	Corr. Pos, Fattore termico indipendente della Pos.[0.1/K]		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-10000 / 10000		
Default value:		0	**Cyc. transmittable:**	no

P-0-0408, Pos. corr., prec. corr. start position

The precision correction function is for use in extremely accurate applications. It consists of a table of correction values which are assigned to specific positions of the encoder. Parameter **P-0-0408, Pos. corr., prec. corr. start position**, defines the start position of the correction table. It is the smallest position in the correction range.

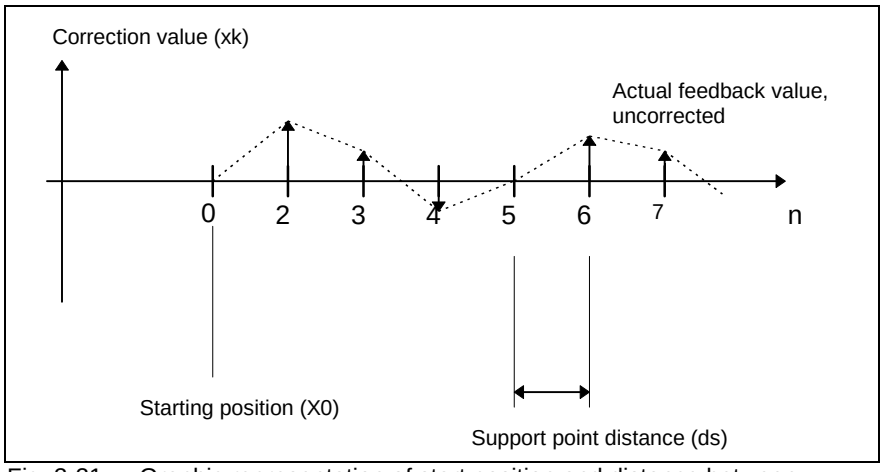

Fig. 3-31: Graphic representation of start position and distance between support point.

See also the functional description: "Axis error correction"

P-0-0408 - Attributes

Para. Name:	**DE**	Pos.-Korr., Startposition Präz.		
	EN	Pos. corr., prec. corr. start position		
	FR	Corr. de pos., position initiale préc.		
	ES	Correccion de pos., factor de temp. depend. de pos.		
	IT	Corr. Pos., Posizione iniziale prec.		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-2147483648 / 2147483647		
Default value:		0	**Cyc. transmittable:**	no

P-0-0409, Pos. corr., correction table for prec. corr.

For highly accurate applications, correction values for the encoder are determined by measuring the axis. These correction values are stored in parameter **P-0-0409, Pos. corr., correction table for prec. corr.**. 500 correction values can be stored for motion in each direction. The first 500 correction values are reserved for motion in the positive direction, and the second 500 are reserved for motion in the negative direction.

A correction value is defined as a 2-byte unit of data, which limits input values to ±2^15 in the selected direction of motion.

The difference between two adjacent correction values must not be greater than the value of parameter **P-0-0410, Pos. corr., support point distance for prec. corr.**.

To avoid excessive leaps in feedback values, the first and last correction value in each direction must be defined as 0. All 1000 correction values must always be written. Support points which are not needed can be set to 0.

The table is composed as follows:

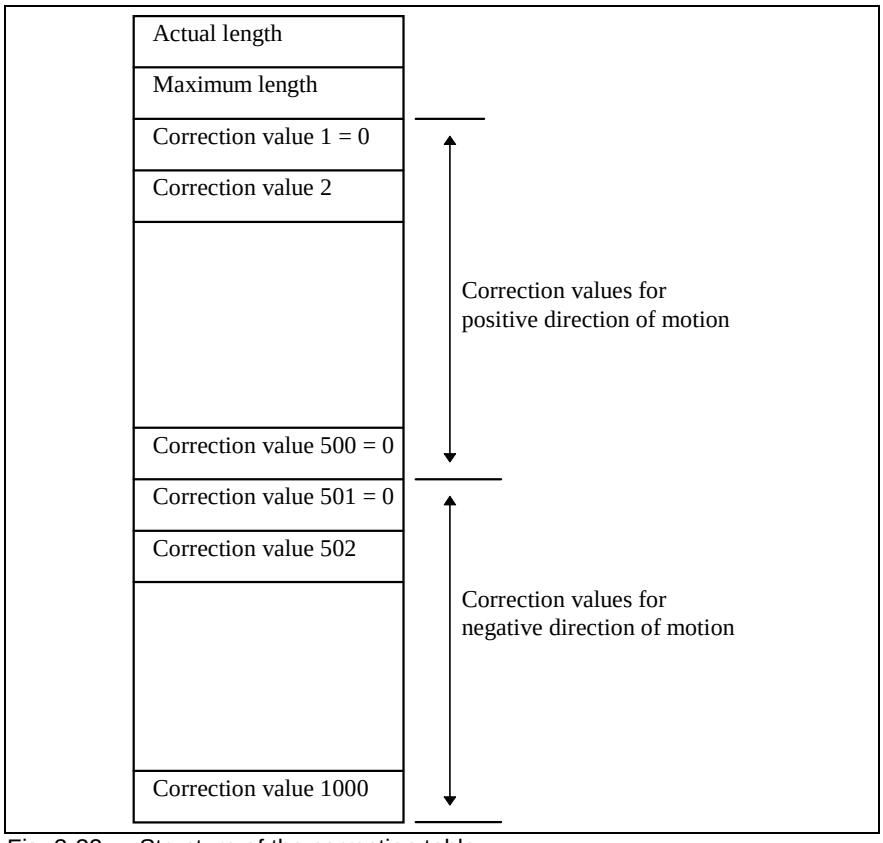
Actual length
Maximum length
Correction value 1 = 0
Correction value 2
Correction values for positive direction of motion
Correction value 500 = 0
Correction value 501 = 0
Correction value 502
Correction values for negative direction of motion
Correction value 1000

Fig. 3-32: Structure of the correction table

See also the functional description: "Axis error correction"

P-0-0409 - Attributes

Para. Name:	**DE**	Pos.-Korr., Korrekturtabelle Präz.		
	EN	Pos. corr., correction table for prec. corr.		
	FR	Corr. de pos., table de corr. préc.		
	ES	Correccion de pos., tabla correccion de precision		
	IT	Corr. Pos., Tabella di Precisione		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte variabel	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-32768 / 32767		
Default value:		0	**Cyc. transmittable:**	no

P-0-0410, Pos. corr., support point distance for prec. corr.

Parameter **P-0-0410, Pos. corr., support point distance for prec. corr.**, defines the distance between two adjacent correction values.

It is constant for the entire correction range (=start position + 499*support point distance), depending on **P-0-0408, Pos. corr., prec. corr. start position**, and defines the positions for which correction values in the table must be determined.

See also the functional description: "Axis error correction"

P-0-0410 - Attributes

Para. Name:	**DE**	Pos.-Korr., Stützpunktabstand Präz.		
	EN	Pos. corr., support point distance for prec. corr.		
	FR	Corr. de pos., écartement des points d'appui préc.		
	ES	Corr. pos, distancia de puntos de apoyo prec.		
	IT	Corr. Pos., Distanza di Campionamento per prec.		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	Phase3
Unit:		S-0-0076	**Extrem value check:**	no
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-2147483648 / 2147483647		
Default value:		0	**Cyc. transmittable:**	no

P-0-0420, Analog output 1 signal selection

Using **P-0-0420, Analog output 1 signal selection**, an ID no. can be assigned to the analog AK1 output channel on the X3 connector.The parameter with the assigned ID no. can be visualized with an oscilloscope in the form of an analog voltage. Only those ID no. in the list **P-0-0426, Analog outputs, IDN list of assignable parameters** can be used.

See also the functional description: "Analog Output"

P-0-0420 - Attributes

Para. Name:	**DE**	Analog-Ausgang 1, Signalauswahl		
	EN	Analog output 1 signal selection		
	FR	Sortie analogique 1, sélection de signal		
	ES	Salida analógica 1, selección de señal		
	IT	Uscita analogica 1, Scelta del Segnale		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0421, Analog output 1, expanded signal selection

To be able to show signals as analog voltages, but which are not in **P-0-0426, Analog outputs, IDN list of assignable parameters**, then the option of an expanded signal select is possible. This becomes active as long as no parameter is assigned via **P-0-0420, Analog output 1 signal selection**.

The following expended signal select options are available:

- expanded signal select with permanently defind signals
- byte output
- bit output

1) Expanded signal selection with permanently- defind signals

Internal signal numbers are assigned which are not in the drive in the form of ID numbers. These signals have permanent units making an evaluation via **P-0-0422, Analog output 1, scalling per 10V full scale** possible. The evaluation factor 1.0 equals the permanent unit. The following permanently defined signals are possible:

Signalnumber P-0-0421	Output signal	Ref. Unit: eval factor=1.0
0x00000001	motor encoder sine signal	0.5V/10V
0x00000002	motor encoder cosine signal	0.5V/10V
0x00000003	Ext. enc. sine signal	0.5V/10V
0x00000004	Ext. enc. sine cosine	0.5V/10V
0x00000005	Position command difference on the pos. controler	rot. =>1000rpm/10V lin. =>100m/min/10V
0x00000006	DC bus power	1kW/10V
0x00000007	absolute DC bus power amount	1kW/10V
0x00000008	effective current	S-0-0110/10V
0x00000009	relative current	S-0-0110/10V
0x0000000a	thermal load	100%/10V
0x0000000b	motor temperature	150^C/10V
0x0000000c	magnetizing current	S-0-0110/10V
0x0000000d	velocity command at the velocity controller	rot. =>1000rpm/10V lin. => 100m/min/10V

Fig. 3-33: Signal select list with predefined signal selection

The outputs are scaling dependent and always relate to the motor shaft given position and relocity data

2) Byte output

It is possible herewith to output memory cells of the data memory as analog voltage. It can only be practically applied if the data storage stuctures is familiar. As this is, however, different from version to version, the the function can only be used by the respective developer. The function is activated by setting bit 28 in **P-0-0421, Analog output 1, expanded signal selection**. The adress of the memory cell is defined in the low word of the expanded signal selection.

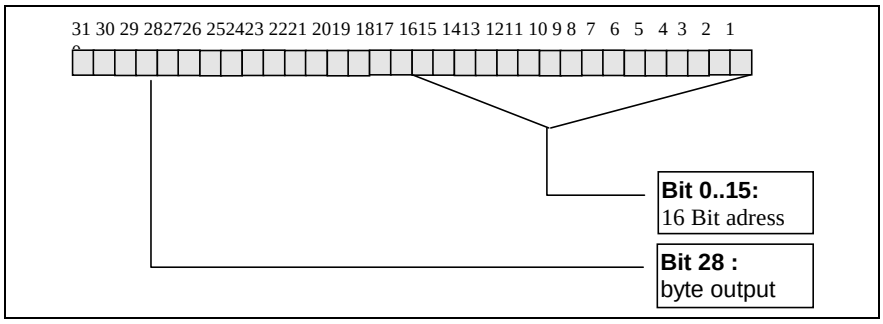

Fig. 3-34: Definition **P-0-0421, Analog output 1, enlarged signal selection** with byte output- definition

3) Bit output

Individual bits of the data memory can be shown as analog voltage herewith.If the respective bit is set, then 10V voltage is output at the analog output. A reset bit outputs -10V. The function is activated by setting bit 29 and inputting the desired memory address in **P-0-0421, Analog output 1, expanded signal selection**.

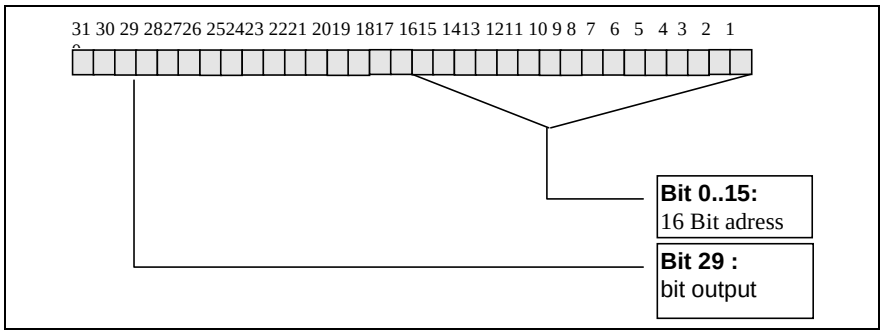

Fig. 3-35: Definition **P-0-0421, Analog output 1, enlarged signal selection** with byte output- definition

See also the functional description: "Analog Output"

P-0-0421 - Attributes

Para. Name:	**DE**	Analog-Ausgang 1, erweiterte Signalauswahl
	EN	Analog output 1, expanded signal selection
	FR	Sortie analogique 1, sélection de signal élargie
	ES	Salida analógica 1, selección de señal ampliada
	IT	Uscita analogica 1, Superamento Scelta

Function:	Parameter	**Editability:**	P234
Data length:	4Byte	**Memory:**	Param. EE
Format:	HEX	**Validity check:**	no
Unit:	--	**Extrem value check:**	no
Decimal places:	--	**Combination check:**	no
Input min/max:	-- / --		
Default value:	0	**Cyc. transmittable:**	no

P-0-0422, Analog output 1, scaling per 10V full scale

P-0-0420, Analog output 1 signal selection, the The resolution of the selected signal can be varied with parameter **P-0-0422, Analog output 1 scaling per 10V full scale**. If an ID no. was assigned via evalution is assigned the same unit as the parameter with the assigned ID number.

The output of pre- defined signals means that the evalution has a decimal fuctior of 4 decimal places. It has a permanent referance with permanent unit.

The evaluation defines the least- significal bit with bit and byte outputs, if such are output. The input is decimal without decimal places.

See also the functional description: "Analog Output"

P-0-0422 - Attributes

Para. Name:	**DE**	Analog-Ausgang 1, Bewertung [1/10V]		
	EN	Analog output 1, scaling per 10V full scale		
	FR	Sortie analogique 1, calibrage [1/10V]		
	ES	Salida analógica 1, calibrado [1/10V]		
	IT	Uscita analogica 1, Scala per 10V fondo scala		
Function:		Parameter	**Editability:**	P234
Data length:		---	**Memory:**	Param. EE
Format:		P-0-0420/P-0-0421	**Validity check:**	no
Unit:		P-0-0420/P-0-0421	**Extrem value check:**	no
Decimal places:		P-0-0420/P-0-0421	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0423, Analog output 2, signal selection

Using **P-0-0423, Analog output 2, signal selection**, an ID no. can be assigned to the analog AK2 output channel on the X3 connector.The parameter with the assigned ID no. can be visualized with an oscilloscope in the form of an analog voltage. Only those ID no. in the list **P-0-0426, Analog outputs, IDN list of assignable parameters** can be used.

See also the functional description: "Analog Output"

P-0-0423 - Attributes

Para. Name:	**DE**	Analog-Ausgang 2, Signalauswahl		
	EN	Analog output 2, signal selection		
	FR	Sortie analogique 2, sélection de signal		
	ES	Salida analógica 2, selección de señal		
	IT	Uscita analogica 2, Scelta del Segnale		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0424, Analog output 2, expanded signal selection

To be able to show signals as analog voltages, but which are not in **P-0-0426, Analog outputs, IDN list of assignable parameters**, then the option of an expanded signal select is possible. This becomes active as long as no parameter is assigned via **P-0-0423, Analog output 2 signal selection**.

The following expended signal select options are available:

- expanded signal select with permanently defind signals
- byte output
- bit output

1) Expanded signal selection with permanently- defind signals

Internal signal numbers are assigned which are not in the drive in the form of ID numbers. These signals have permanent units making an evaluation via **P-0-0425, Analog output 2, scalling per 10V full scale** possible. The evaluation factor 1.0 equals the permanent unit. The following permanently defined signals are possible:

Signalnumber P-0-0424	Output signal	Ref. Unit: eval factor=1.0
0x00000001	motor encoder sine signal	0.5V/10V
0x00000002	motor encoder cosine signal	0.5V/10V
0x00000003	Ext. enc. sine signal	0.5V/10V
0x00000004	Ext. enc. sine cosine	0.5V/10V
0x00000005	Position command difference on the pos. controler	rot. =>1000rpm/10V lin. =>100m/min/10V
0x00000006	DC bus power	1kW/10V
0x00000007	absolute DC bus power amount	1kW/10V
0x00000008	effective current	S-0-0110/10V
0x00000009	relative current	S-0-0110/10V
0x0000000a	thermal load	100%/10V
0x0000000b	motor temperature	150^C/10V
0x0000000c	magnetizing current	S-0-0110/10V
0x0000000d	velocity command at the velocity controller	rot. =>1000rpm/10V lin. => 100m/min/10V

Fig. 3-36: Signal select list with predefined signal selection

The outputs are scaling dependent and always relate to the motor shaft given position and relocity data

2) Byte output

It is possible herewith to output memory cells of the data memory as analog voltage. It can only be practically applied if the data storage stuctures is familiar. As this is, however, different from version to version, the the function can only be used by the respective developer. The function is activated by setting bit 28 in **P-0-0424, Analog output 2, expanded signal selection**. The adress of the memory cell is defined in the low word of the expanded signal selection.

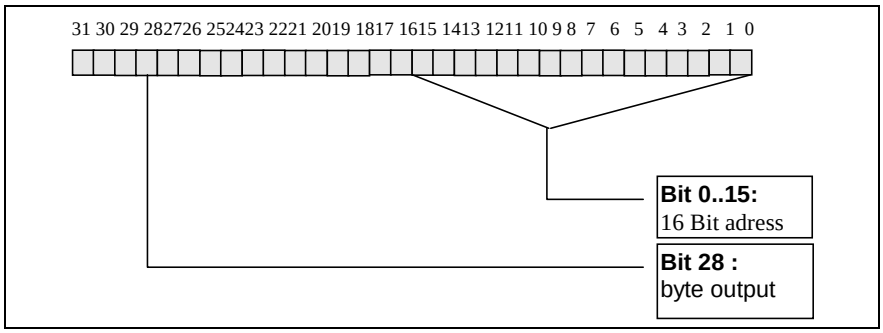

Fig. 3-37: Definition **P-0-0424, Analog output 2, expanded signal selection** with byte output- definition

3) Bit output

Individual bits of the data memory can be shown as analog voltage herewith.If the respective bit is set, then 10V voltage is output at the analog output. A reset bit outputs -10V. The function is activated by setting bit 29 and inputting the desired memory address in **P-0-0424, Analog output 2, expanded signal selection**.

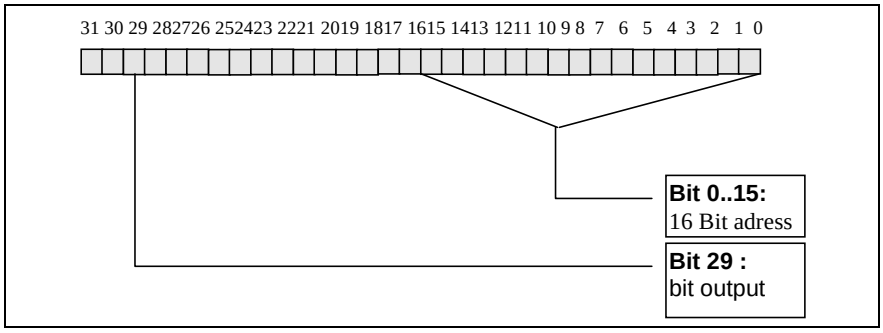

Fig. 3-38: Definition **P-0-0424, Analog output 2, expanded signal selection** with byte output- definition

See also the functional description: "Analog Output"

P-0-0424 - Attributes

Para. Name:	**DE**	Analog-Ausgang 2, erweiterte Signalauswahl		
	EN	Analog output 2, expanded signal selection		
	FR	Sortie analogique 2, sélection de signal élargie		
	ES	Salida analógica 2, selección de señal ampliada		
	IT	Uscita analogica 2, Superamento Scelta		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0425, Analog output 2, scaling per 10V full scale

The resolution of the selected signal can be varied with parameter **P-0-0425, Analog output 2 scaling per 10V full scale**. If an ID no. was assigned via **P-0-0423, Analog output 2, signal selection**, the evalution is assigned the same unit as the parameter with the assigned ID number.

The output of pre- defined signals means that the evalution has a decimal fuctior of 4 decimal places. It has a permanent referance with permanent unit.

The evaluation defines the least- significal bit with bit and byte outputs, if such are output. The input is decimal without decimal places.

See also the functional description: "Analog Output"

P-0-0425 - Attributes

Para. Name:	**DE**	Analog-Ausgang 2, Bewertung [1/10V]		
	EN	Analog output 2, scaling per 10V full scale		
	FR	Sortie analogique 2, calibrage [1/10V]		
	ES	Salida analógica 2, calibrado [1/10V]		
	IT	Uscita analogica 2, Scala per 10V fondo scala		
Function:		Parameter	**Editability:**	P234
Data length:			**Memory:**	Param. EE
Format:		P-0-0420/P-0-0421	**Validity check:**	no
Unit:		P-0-0420/P-0-0421	**Extrem value check:**	no
Decimal places:		P-0-0420/P-0-0421	**Combination check:**	no
Input min/max:		-- / --		
Default value:		0	**Cyc. transmittable:**	no

P-0-0426, Analog outputs, IDN list of assignable parameters

Parameter P-0-0426, Analog outputs, IDN list of assignable parameters contains a list of parameters assignable via **P-0-0420, Analog output 1 signal selection** or **P-0-0423, Analog output 2, signal selection**.

See also the functional description: "Analog Output"

P-0-0426 - Attributes

Para. Name:	**DE**	Analog-Ausgabe, IDN-Liste der zuweisbaren Parameter		
	EN	Analog outputs, IDN list of assignable parameters		
	FR	Sorties analog., liste des paramètres pouvant être assignés		
	ES	Salida analógica, lista IDN de los números ID asignables		
	IT	Uscite analogiche, Lista IDN dei Parametri assignabili		
Function:		Parameter	**Editability:**	no
Data length:		2Byte variabel	**Memory:**	no
Format:		IDN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		- / -		
Default value:		---	**Cyc. transmittable:**	no

P-0-0508, Commutation offset

For synchronous motors, this parameter indicates the offset between the raw value of the motor encoder and the resulting absolute electrical angle between the stator current vector and the rotor flux vector.

For motors with motor feedback data memory, the commutator offset is stored in memory and therefore does not need to be entered.

For linear synchronous motors, this value must always be redetermined if

- The motor probe system encounters a change in its mechanical structure.
- A mechanical restructuring of primary and secondary portions is takes place.

See also the functional description: "Synchronous-asynchronous"

P-0-0508 - Attributes

Para. Name:	**DE**	Kommutierungs-Offset		
	EN	Commutation offset		
	FR	Offset de commutation		
	ES	Offset de conmutacion		
	IT	Offset di Commutazione		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		0	**Cyc. transmittable:**	no

P-0-0509, Slot angle

This parameter is not currently available for use.

P-0-0509 - Attributes

Para. Name:	**DE**	Passfedernut-Winkel		
	EN	Slot angle		
	FR	Angle de clavette		
	ES	Angulo de chavetero		
	IT	Angolo di Inserzione		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_MV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0510, Moment of inertia of the rotor

This parameter indicates the moment of inertia of the rotor without load. For motors with feedback memory (e.g. MKD), it is saved in the feedback.

See also the functional description: "Motor Feedback-Data Memory"

P-0-0510 - Attributes

Para. Name:	**DE**	Rotorträgheitsmoment		
	EN	Moment of inertia of the rotor		
	FR	Couple d'inertie du rotor		
	ES	Par de inercia de rotor		
	IT	Coppia di Inerzia del Rotore		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		kgm^2	**Extrem value check:**	no
Decimal places:		5	**Combination check:**	no
Input min/max:		1 / 10000000		
Default value:		10000	**Cyc. transmittable:**	no

P-0-0511, Brake current

The brake current is monitored by the drive controller if the motor is equipped with a blocking brake and a value other than 0 is entered in this parameter. If the brake current lies outside the range

(0.7 . . . 1.3) • P-0-0511,

then error message **F268 Brake fault** will be generated.

See also the functional description: "Motor Holding Brake"

P-0-0511 - Attributes

Para. Name:	**DE**	Haltebremsenstrom		
	EN	Brake current		
	FR	Courant frein		
	ES	Corriente de frenado de parada		
	IT	Corrente Freno		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0 / 500000		
Default value:		0	**Cyc. transmittable:**	no

P-0-0518, Amplifier nominal current 2

This parameter specifies the maximum nominal current of the amplifier at reduced peak current.

It specifies together with the parameters

- S-0-0110, Amplifier peak current
- S-0-0112, Amplifier nominal current
- P-0-0519, Amplifier peak current 2

the length of the peak current characteristics line for the peak current limit of the amplifier.

No value can be entered since it is permanently programmed within the amplifier.

P-0-0518 - Attributes

Para. Name:	**DE**	Verstärker-Nennstrom 2		
	EN	Amplifier nominal current 2		
	FR	Courant nominal variateur 2		
	ES	Amplificador corriente nominal 2		
	IT	Corrente Nominale Azionamento 2		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		1 / 500000		
Default value:		---	**Cyc. transmittable:**	no

P-0-0519, Amplifier peak current 2

The drive allows you to define a changed continuous peak current characteristic line with reduced amplifier peak current, and therefore an increased amplifier continuous current.

Parameter P-0-0519 specifies an amplifier peak current for this case.

It determines the working points on the peak current characteristic line.

No value for this parameter can be entered, since it is permanently programmed in the amplifier.

P-0-0519 - Attributes

Para. Name:	**DE**	Verstärker-Spitzenstrom 2		
	EN	Amplifier peak current 2		
	FR	Courant crête variateur 2		
	ES	Amplificador corriente punta 2		
	IT	Corrente di Picco Azionamento 2		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		1 / 500000		
Default value:		---	**Cyc. transmittable:**	no

P-0-0523, Commutation, probe value

If the commutation offset for linear synchronous motors is to be set with the **P-0-0524, Commutation command**, then the setting probe value should be entered in the **P-0-0532, Premagnetization factor** parameter.

The parameter can be written if the feature is opened with the input of the appropriate password.

See also the functional description: "Determining the commutation offset"

P-0-0523 - Attributes

Para. Name:	**DE**	Kommutierungseinstellung Messwert		
	EN	Commutation, probe value		
	FR	Mesure reglage de commutation		
	ES	Ajuste de conmutacion, valor de medicion		
	IT	Commutazione, Valore di Probe		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		S-0-0076	**Extrem value check:**	yes
Decimal places:		S-0-0076	**Combination check:**	no
Input min/max:		-2147483648 / 2147483647		
Default value:		---	**Cyc. transmittable:**	no

P-0-0524, Commutation command

Parameter P-0-0524 can activate the command for setting the commutator offset. The command can only be used when:

- the appropriate password is entered
- torque control mode is active
- drive enable is on

If these criteria are met, the drive will automatically set the appropriate commutator offset for synchronous motors.

See also the functional description: "Determining the commutation offset"

P-0-0524 - Attributes

Para. Name:	**DE**	Kommutierungseinstellung Kommando		
	EN	Commutation command		
	FR	Commande reglage de commutation		
	ES	Comando ajuste de conmutacion		
	IT	Commutazione - Comando		
Function:		Command	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-0525, Type of motor brake

This parameter specifies whether a electrically released or electrically applied brake is being used. If an **MDD** or **MDK** motor is used, then the brake will be self-stopping, if there is a brake. The parameter will be set automatically to 0. If other motor types are used, this parameter must be entered during the startup procedure.

See also the functional description: "Motor Holding Brake"

P-0-0525 - Attributes

Para. Name:	**DE**	Haltebremsentyp		
	EN	Type of motor brake		
	FR	Type de frein		
	ES	Tipo de freno de motor		
	IT	Tipo di Freno		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		--	**Combination check:**	no
Input min/max:		0 / 1		
Default value:		0	**Cyc. transmittable:**	no

P-0-0526, Brake control delay

If a holding brake is being used, the time delay between the start of the brake and when it becomes effective must be set in this parameter. This value is entered automatically when **MDD**, **MKD** or **MKE** motors are used. If Indramat brakes are used in conjunction with asynchronous motors, then the standard value to be entered is 100 ms.

See also the functional description: "Motor Holding Brake"

P-0-0526 - Attributes

Para. Name:	**DE**	Haltebremsen-Verzugszeit		
	EN	Brake control delay		
	FR	Délai frein		
	ES	Retardo de control de freno		
	IT	Ritardo Freno		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 100000		
Default value:		100	**Cyc. transmittable:**	no

P-0-0530, Slip increase

In asynchronous motors, the rotor resistance and the rotor time constant change with the temperature. The slip increase compensates for this change.

The slip increase per 100K(elvin) is motor-specific and is specified by Indramat for each individual motor.

See also the functional description: "Asynchronous motors"

P-0-0530 - Attributes

Para. Name:	**DE**	Schlupfanhebung		
	EN	Slip increase		
	FR	Accroissement de glissement par température		
	ES	Aumento de deslizamiento		
	IT	Incremento Slip		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		1/100K	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		100 / 300		
Default value:		100	**Cyc. transmittable:**	no

P-0-0531, Stall current limit

The stall current limit is used to limit the peak current of the motor to reasonable values when operating at high velocities. Higher currents lead only to higher losses, not to more wave power.

This limit value is set by Indramat. If 0 is entered, the limit is inactive.

See also the functional description: "Asynchronous motors"

P-0-0531 - Attributes

Para. Name:	**DE**	Kippstromgrenze		
	EN	Stall current limit		
	FR	Limite du courant bascule		
	ES	Limite de corriente de volcado		
	IT	Limite di Corrente di Inversione		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A/Vmin	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 4294967295		
Default value:		100	**Cyc. transmittable:**	no

P-0-0532, Premagnetization factor

The pre-magnetization factor is used for application-dependent decreases in the Servo magnetization current. Together with parameter **P-0-4004, Magnetizing current**, it specifies the motor's magnetization current.

Effective magnetization current = magnetization current • pre-magnetization scaling factor

With a pre-magnetizing factor of 100%, the Servo magnetization current in the motor will flow so that a torque proportional to the momentum-producing current will result in the basic rotation range.

See also the functional description: "Scaling factor pre-magnetizing"

P-0-0532 - Attributes

Para. Name:	**DE**	Vormagnetisierungsfaktor		
	EN	Premagnetization factor		
	FR	Facteur de pré-magnétisation		
	ES	Factor de magnetizacion previa		
	IT	Fattore di Premagnetizzazione		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		%	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		25 / 100		
Default value:		100	**Cyc. transmittable:**	no

P-0-0533, Flux loop prop. gain

The flux loop controls the magnetization current in the field-weakening range.

The parameter value is set by Indramat.

See also the functional description: "Asynchronous motors"

P-0-0533 - Attributes

Para. Name:	**DE**	Feldregler Prop.verst.		
	EN	Flux loop prop. gain		
	FR	Gain prop. de l'asservissement de flux		
	ES	Regulador de campo amplificacion proporcional		
	IT	Guadagno prop. Anello di Flusso		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A/V	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		100 / 65535		
Default value:		1000	**Cyc. transmittable:**	no

P-0-0534, Flux loop integral action time

The flux loop **controls the magnetization current** in the field-weakening range.

The parameter value is set by Indramat.

See also the functional description: "Asynchronous motors".

P-0-0534 - Attributes

Para. Name:	**DE**	Feldregler Nachstellzeit		
	EN	Flux loop integral action time		
	FR	Part intégrale de l'asservissement de flux		
	ES	Regulador de campo tiempo de reajuste		
	IT	Tempo Integrazione Anello di Flusso		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		100	**Cyc. transmittable:**	no

P-0-0535, Motor voltage at no load

The motor voltage in the field-weakening range is set so that it reaches a value lower than the DC bus voltage.

Under load, the motor voltage will be raised to the maximum motor voltage.

See also the functional description: "Asynchronous motors"

P-0-0535 - Attributes

Para. Name:	**DE**	Motorleerlaufspannung		
	EN	Motor voltage at no load		
	FR	Tension moteur á vide		
	ES	Tension de marcha en vacio de motor		
	IT	No Carico Tensione Motore		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		%Uzwk	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		500 / 1000		
Default value:		1000	**Cyc. transmittable:**	no

P-0-0536, Motor voltage max.

The motor voltage in the field-weakening range is set so that it reaches a value lower than the DC bus voltage.

During full load, the motor voltage will rise to the maximum motor voltage. The output voltage will be sinusoidal up to a value of 90%.

See also the functional description: "Asynchronous motors"

P-0-0536 - Attributes

Para. Name:	**DE**	Motormaximalspannung		
	EN	Motor voltage max.		
	FR	Tension max. moteur		
	ES	Tension maxima de motor		
	IT	Tensione Motore massima		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		%Uzwk	**Extrem value check:**	yes
Decimal places:		1	**Combination check:**	no
Input min/max:		500 / 1000		
Default value:		1000	**Cyc. transmittable:**	no

P-0-0537, S1-Kink-speed

Starting with the S1 kink speed, core losses result in.a drop in power. This motor-specific velocity determined by Indramat is only useful for the "S1 operating mode". From this velocity on, the field quickly weakens so as to keep the motor temperature low.

See also the functional description: "Asynchronous motors"

P-0-0537 - Attributes

Para. Name:	**DE**	S1-Eckdrehzahl		
	EN	S1-Kink-speed		
	FR	Vitesse coin S1		
	ES	S1-N.d.r. angular		
	IT	S1 Velocità di Curvatura		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Rpm	**Extrem value check:**	yes
Decimal places:		4	**Combination check:**	no
Input min/max:		0 / 4294967295		
Default value:		0	**Cyc. transmittable:**	no

P-0-0538, Motor function parameter 1

Bit 0: 1 = Function S1 Operation active

See also the functional description: "S1-Operation Function"

P-0-0538 - Attributes

Para. Name:	**DE**	Motorfunktionsparameter 1		
	EN	Motor function parameter 1		
	FR	Paramètre de fonctions 1 moteur		
	ES	Parametros de funcion 1 de motor		
	IT	Parametro Funzioni 1 Motore		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		BIN	**Validity check:**	Phase3
Unit:		---	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	yes
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-1201, Ramp 1 pitch

Parameter **P-0-1201, Ramp 1 pitch**, takes effect in "Velocity control" operating mode and during execution of error response "Velocity command value, zero-switch with pitch and filter".

The acceleration and delay entered here are used to create a pitch starting from the last effective command value to the new command value.

In "Velocity control" operating mode, the resulting velocity command value is derived from the sum of the value resulting from the pitch function in **S-0-0036, Velocity command value** and the direct value in **S-0-0037, Additive velocity command value**.

When error response "Velocity command value, zero-switch with pitch and filter" is executed, velocity proceeds from the current feedback velocity to 0, using the effective velocity command value with the delay specified by the parameter in **P-0-1201, Ramp 1 pitch**.

See also the functional description: "Velocity command value reset with filter and slope"

P-0-1201 - Attributes

Para. Name:	**DE**	Steigung Rampe 1		
	EN	Ramp 1 pitch		
	FR	Montée Rampe 1		
	ES	Rampa de velocidad 1		
	IT	Velocità Rampa 1		
Function:		Parameter	**Editability:**	P234
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		S-0-0160	**Extrem value check:**	yes
Decimal places:		S-0-0160	**Combination check:**	no
Input min/max:		0 / 2147483647		
Default value:		0	**Cyc. transmittable:**	no

P-0-1222, Velocity command filter

Parameter **P-0-1222, Velocity command filter** works in "Velocity control" operating mode and in response to the error "Velocity command value zero-switch with slope and filter."

The time constant entered here is used in velocity control operating mode to pass the value in **S-0-0036, Velocity command value** which has been pitched by **P-0-1201, Ramp 1 pitch**, through a deep-pass filter.

This serves to diminish surges in acceleration over the course of command values.

The resulting velocity command value results from the sum of the sloped and filtered value in **S-0-0036, Velocity command value** and the direct value in **S-0-0037, Additive velocity command value**.

When error response "Velocity command value, zero-switch with pitch and filter" is executed, velocity proceeds from the current feedback velocity to 0, using the effective velocity command value with the delay specified by the parameter in **P-0-1201, Ramp 1 pitch**. It is also passes through the deep pass filter specified by **P-0-1222, Velocity command filter**.

See also the functional description: "Velocity command value reset with filter and slope"

P-0-1222 - Attributes

Para. Name:	**DE**	Geschwindigkeits-Sollwert-Filter		
	EN	Velocity command filter		
	FR	Filtrage de consigne vitesse		
	ES	Constante temporal de alisado de valor nominal		
	IT	Filtro su Velocità comandata		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		ms	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 999		
Default value:		0	**Cyc. transmittable:**	no

P-0-4000, Current-zero-trim phase U

This parameter serves to display the determined result of the zero-trim procedure for the current feedback sensor of phase U.

P-0-4000 - Attributes

Para. Name:	**DE**	Strommess-Nullabgleich Phase U		
	EN	Current-zero-trim phase U		
	FR	Reglage courant nul phase U		
	ES	Compensacion cero de medicion de corriente fase U		
	IT	Regolazione Corrente 0 Fase U		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		%	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 10000		
Default value:		---	**Cyc. transmittable:**	no

P-0-4001, Current-zero-trim phase V

This parameter serves to display the determined result of the zero-trim procedure for the current feedback sensor of phase V.

P-0-4001 - Attributes

Para. Name:	**DE**	Strommess-Nullabgleich Phase V		
	EN	Current-zero-trim phase V		
	FR	Reglage courant nul phase V		
	ES	Compensacion cero de medicion de corriente fase V		
	IT	Regolazione Corrente 0 Fase V		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_MV	**Validity check:**	no
Unit:		%	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 10000		
Default value:		---	**Cyc. transmittable:**	no

P-0-4002, Current-amplify-trim phase U

For trimming of the current sensor regarding its gain error, this parameter is determined in the test area for the Indramat drive controllers.

P-0-4002 - Attributes

Para. Name:	**DE**	Strommess-Verst.abgleich Phase U		
	EN	Current-amplify-trim phase U		
	FR	Reglage amplification courant phase U		
	ES	Compensacion de amplif. de medicion de corriente fase U		
	IT	Regolaz. Aplif. Corrente Fase U		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		4	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-0-4003, Current-amplify-trim phase V

For trimming of the current sensor regarding its gain error, this parameter is determined in the test area for the Indramat drive controllers.

P-0-4003 - Attributes

Para. Name:	**DE**	Strommess-Verst.abgleich Phase V		
	EN	Current-amplify-trim phase V		
	FR	Reglage amplification courant phase V		
	ES	Compensacion de amplif. de medicion de corriente fase V		
	IT	Regolaz. Amplif. Corrente Fase V		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		4	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-0-4004, Magnetizing current

This parameter indicates the nominal or servo-magnetization current set by Indramat for asynchronous motors. The magnetizing current actually flowing is also dependent on the premagnetization scaling factor.

For synchronous motors, this parameter is automatically set to 0.

See also the functional description: "Asynchronous motors"

P-0-4004 - Attributes

Para. Name:	**DE**	Magnetisierungsstrom		
	EN	Magnetizing current		
	FR	Courant de magnétisation		
	ES	Corriente de magnetizacion		
	IT	Corrente di Magnetizzazione		
Function:		Parameter	**Editability:**	P23
Data length:		4Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		4	**Combination check:**	no
Input min/max:		0 / S-0-0110		
Default value:		7500	**Cyc. transmittable:**	no

P-0-4011, Switching frequency

This parameter is used to set the switching frequency of the pulse with modulation controller to **4 kHz or 8 kHz**.

See also the functional description: "Setting the Active Continuous Current"

P-0-4011 - Attributes

Para. Name:	**DE**	Schaltfrequenz		
	EN	Switching frequency		
	FR	Fréquence de coupure		
	ES	Frecuencia de conexion		
	IT	Frequenza di Commutazione		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		kHz	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	yes
Input min/max:		4 / 8		
Default value:		4	**Cyc. transmittable:**	no

P-0-4012, Slip factor

The slip factor is the most important parameter for asynchronous motors. It indicates the rotor frequency in relation to the torque-producing current. The lower the rotor time constant is, the higher the slip factor.

This parameter is set motor-specifically by Indramat.

See also the functional description: "Asynchronous motors"

P-0-4012 - Attributes

Para. Name:	**DE**	Schlupffaktor		
	EN	Slip factor		
	FR	Facteur de glissement		
	ES	Factor de deslizamiento		
	IT	Fattore di Slip		
Function:		Parameter	**Editability:**	P234
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		Hz/100A	**Extrem value check:**	yes
Decimal places:		2	**Combination check:**	no
Input min/max:		1 / 50000		
Default value:		100	**Cyc. transmittable:**	no

P-0-4014, Motor type

The motor type can be selected with this parameter.

- 1: MDD
- 2: 2AD / 1MB with NTC sensor
- 3: LSF
- 4: LAR / LAF
- 5: MKD / MKE
- 6: 2AD /1MB with PTC sensor
- 7: synchron kit motor

See also the functional description: "Setting of the Motor Type Through P-0-4014, Motor Type"

P-0-4014 - Attributes

Para. Name:	**DE**	Motorart		
	EN	Motor type		
	FR	Type de moteur		
	ES	Tipo de motor		
	IT	Tipo Motore		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		1 / 7		
Default value:		1	**Cyc. transmittable:**	no

P-0-4015, Intermediate voltage

The Intermediate voltage is stored in the amplifier as a parameter.

The parameter cannot be edited and is only for display and internal calculations (PWM).

P-0-4015 - Attributes

Para. Name:	**DE**	Zwischenkreisspannung		
	EN	Intermediate voltage		
	FR	Tension du circuit intermédiaire		
	ES	Tension de circuito intermedio		
	IT	Tensione sul Bus DC		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		V	**Extrem value check:**	yes
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 1000		
Default value:		---	**Cyc. transmittable:**	no

P-0-4021, Baud rate RS-232/485

Various baud rates (transmission speeds) can be set for communications via the serial interfaces.

Baud rate [Baud]	**Setting in parameter P-0-4021**
9600	0
19200	1

Fig. 3-39: Settable baud rates

Note: Do not change the baud rate in the list of all parameters in DriveTop. Doing so would lock out all further communications in DriveTop versions < 3.

P-0-4021 - Attributes

Para. Name:	**DE**	Baud-Rate RS-232/485		
	EN	Baud rate RS-232/485		
	FR	Baud-Rate RS-232/485		
	ES	Frecuencia de baudios RS-232/485		
	IT	Baud Rate RS-232/485		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		-- / --		
Default value:		---	**Cyc. transmittable:**	no

P-0-4022, Drive address

When communicating via RS485-interface with more than one drive, each drive must have different addresses, so that only the addressed drive reacts.

Addresses can be set from 0 to 99.

In a terminal program, the selection of the drive with the desired address is done through BCD: Drive Address .

P-0-4022 - Attributes

Para. Name:	**DE**	Antriebsadresse		
	EN	Drive address		
	FR	Adresse entraînement		
	ES	Direccion de accionamiento		
	IT	Indirizzo Azionamento		
Function:		Parameter	**Editability:**	P23
Data length:		2Byte	**Memory:**	Param. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 256		
Default value:		256	**Cyc. transmittable:**	no

P-0-4023, C400 Communication phase 2 transition

Switching command from drive mode (i.e., out of phase 3 (P3)) **to parameter mode** (Phase 2(P2)).

The command can only be processed when the **drive enable** is **off**.

P-0-4023 - Attributes

Para. Name:	**DE**	C400 Umschaltung auf Komm.-Phase 2		
	EN	C400 Communication phase 2 transition		
	FR	C400 Passage en phase 2		
	ES	C400 Conmutacion a fase 2		
	IT	C400 Comando Selezione Modo Parametri		
Function:		Command	**Editability:**	P234
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-4035, Trim-current

In this parameter, the current value is stored with which the **current measurement** of the drive control is precisely adjusted in the factory. This eliminates systematical errors in the current measurement. The value has no meaning to the user and **cannot be changed.**

P-0-4035 - Attributes

Para. Name:	**DE**	Abgleichstrom		
	EN	Trim-current		
	FR	Courant pour le calibrage		
	ES	Corriente para calibrado		
	IT	Regolazione Corrente		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Verst. EE
Format:		DEC_OV	**Validity check:**	Phase3
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		1 / 500000		
Default value:		---	**Cyc. transmittable:**	no

P-0-4036, Contacted motor type

The value of parameter **S-0-0141, Motor type** is stored in this parameter every time the "Basic load" function is executed.

Every time the controller is turned on, the value of parameter **S-0-0141 Motor type** from the motor feedback data memory is compared to P-0-4036. If the data differ, then a different motor has been contacted. The message "UL" will then appear on the SS display. By pressing "S1", the default control parameters of the new motor will be activated.

This feature is relevant only for motors with motor feedback data memory, such as MDD-, MKD or MKE motors.

See also the functional description: "Automatic Execution of the Load Default Feature"

P-0-4036 - Attributes

Para. Name:	**DE**	Angeschlossener Motortyp		
	EN	Contacted motor type		
	FR	Type du moteur raccordé		
	ES	Tipo de motor conectado		
	IT	Tipo di Motore Collegato		
Function:		Parameter	**Editability:**	P234
Data length:		1Byte variabel	**Memory:**	Param. EE
Format:		ASCII	**Validity check:**	Phase3
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		0	**Cyc. transmittable:**	no

P-0-4045, Active permanent current

This value is used to display the continuous current that has been set. The device is not overloaded with this current. It is also the current to which the current limit reduces.

See also the functional description: "Setting the Active Continuous Current"

P-0-4045 - Attributes

Para. Name:	**DE**	Wirksamer Dauerstrom		
	EN	Active permanent current		
	FR	Courant permanent actuel		
	ES	Corriente continua activa		
	IT	Corrente continuativa attiva		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		A	**Extrem value check:**	no
Decimal places:		3	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-4046, Active peak current

The effective peak current parameter P-0-4046 indicates the maximum current that the amplifier can currently deliver. This value is limited by the current limiter. Additional factors are

- **S-0-0092, Bipolar torque limit value**
- **S-0-0109, Motor peak current**

See also the functional description: "Setting the active peak current"

P-0-4046 - Attributes

Para. Name:	**DE**	Wirksamer Spitzenstrom		
	EN	Active peak current		
	FR	Courant crête actuel		
	ES	Corriente punta activa		
	IT	Corrente di Picco Attiva		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	no
Format:		DEC_OV	**Validity check:**	no
Unit:		A	**Extrem value check:**	no
Decimal places:		3	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-0-4094, C800 Command Base-parameter load

With the execution of this command, all parameters in **S-0-0192, IDN list of backup operation data** are set to their base values.

If the firmware in the prog. module is replaced and the parameter memory is incompatible, then error **F209 PL Load parameter default values** is generated.**"PL"** appears on the display.

The command is executed by pressing the S1 button.

See also the functional description: "Basic parameter block"

P-0-4094 - Attributes

Para. Name:	**DE**	C800 Kommando Basisparameter laden		
	EN	C800 Command Base-parameter load		
	FR	C800 Commande chargement des paramètres de base		
	ES	C800 Comando cargar parametro base		
	IT	C800 Comando Caricare Parametri di Base		
Function:		Command	**Editability:**	P23
Data length:		2Byte	**Memory:**	no
Format:		BIN	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		--	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-0018, Number of pole pairs/pole pair distance

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the number of pole pairs of the motor.

P-7-0018 - Attributes

Para. Name:	**DE**	Polpaarzahl/Polpaarweite		
	EN	Number of pole pairs/pole pair distance		
	FR	Nombre de paires de pôles/distance polaire		
	ES	Numero de par de polo/espacio de par de polo		
	IT	Numero di Coppie Poli		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	-
Unit:		pairs of poles/mm	**Extrem value check:**	-
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-0051, Torque/force constant

The Torque/Force constant indicates, how much torque or force the motor delivers at a certain real current.

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the torque constant of the motor.

P-7-0051 - Attributes

Para. Name:	**DE**	Drehmoment-/Kraft-Konstante		
	EN	Torque/force constant		
	FR	Constante de couple/force		
	ES	Constante de par/fuerza		
	IT	Costante di Coppia/Forza		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		Nm/A	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		1 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-7-0508, Commutation offset

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the Commutation Offset of the motor.

P-7-0508 - Attributes

Para. Name:	**DE**	Kommutierungs-Offset		
	EN	Commutation offset		
	FR	Offset de commutation		
	ES	Offset de conmutacion		
	IT	Offset di Commutazione		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-7-0509, Slot angle

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the Slot (keyway) Angle of the motor.

P-7-0509 - Attributes

Para. Name:	**DE**	Passfedernut-Winkel		
	EN	Slot angle		
	FR	Angle de clavette		
	ES	Angulo de chavetero		
	IT	Angolo di Inserzione		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_MV	**Validity check:**	no
Unit:			**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-0510, Moment of inertia of the rotor

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the Moment of inertia of the motor's rotor.

P-7-0510 - Attributes

Para. Name:	**DE**	Rotorträgheitsmoment		
	EN	Moment of inertia of the rotor		
	FR	Couple d'inertie du rotor		
	ES	Par de inercia de rotor		
	IT	Coppia di Inerzia del Rotore		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		kgm^2	**Extrem value check:**	no
Decimal places:		5	**Combination check:**	no
Input min/max:		1 / 10000000		
Default value:		---	**Cyc. transmittable:**	no

P-7-0511, Brake current

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the Brake Current of the motor.

P-7-0511 - Attributes

Para. Name:	**DE**	Haltebremsenstrom		
	EN	Brake current		
	FR	Courant frein		
	ES	Corriente de frenado de parada		
	IT	Corrente Freno		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		A	**Extrem value check:**	yes
Decimal places:		3	**Combination check:**	no
Input min/max:		0 / 500000		
Default value:		---	**Cyc. transmittable:**	no

P-7-0512, Default value for Kv-factor of position control

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the default value for the Kv factor of the position controller. By the command **S-0-0262, C700 Command basic load**, this value is taken into the active parameter **S-0-0104, Position loop Kv-factor**.

P-7-0512 - Attributes

Para. Name:	**DE**	Defaultwert für Lageregler Kv-Faktor		
	EN	Default value for Kv-factor of position control		
	FR	Valeur défaut pour gain asservissement de pos. Kv		
	ES	Regulador de posicion factor Kv, default		
	IT	Fattore Kv Anello di Posizione, Default		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		1000/min	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-7-0513, Feedback type

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the kind and type of the feedback.

P-7-0513 - Attributes

Para. Name:	**DE**	Feedback-Typ		
	EN	Feedback type		
	FR	Type de feedback		
	ES	Tipo de retroalimentacion		
	IT	Tipo di Feedback		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-0514, Absolute encoder offset

For motors with feedback data memory, e.g. MKD, this parameter shows the value stored there for the Absolute Encoder Offset. This value is changed by the command **P-0-0012, C300 Command 'Set absolute measurement.**

P-7-0514 - Attributes

Para. Name:	**DE**	Absolutgeber-Offset		
	EN	Absolute encoder offset		
	FR	Offset du codeur absolu		
	ES	Offset de encoder absoluto		
	IT	Offset Encoder assoluto		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		Incr	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-4028, Impulse wire feedback - offset

The offset of the impulse wires referred to the resolver is saved in this parameter.

It is set in the factory and stored in the feedback memory.

P-7-4028 - Attributes

Para. Name:	**DE**	Impulsdrahtgeber-Offset		
	EN	Impulse wire feedback - offset		
	FR	Offset codeur impulsionnel câblé		
	ES	Offset de encoder de cable de impulso		
	IT	Offset Impulso di Zero		
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-4029, Impulse wire feedback - PIC counter value

This parameter contains the information of the absolute position of the encoder.

The value is updated at every position initialization. The value is read-only and cannot be edited by the user.

P-7-4029 - Attributes

Para. Name:	**DE**	Impulsdrahtgeber-Zählerstand		
	EN	Impulse wire feedback - PIC counter value		
	FR	Valeur du compteur codeur impulsionnel câblé		
	ES	Nivel de contador encoder de cable de impulso		
	IT			
Function:		Parameter	**Editability:**	no
Data length:		4Byte	**Memory:**	Feedb. EE
Format:		HEX	**Validity check:**	no
Unit:		--	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		--- / ---		
Default value:		---	**Cyc. transmittable:**	no

P-7-4037, Velocity loop prop. gain, default

The default value for the velocity encoder proportional amplifier. The parameter is set at the factory and cannot be changed. With „default parameter load", the value of the parameter will be copied into parameter **S-0-0100, Velocity loop proportional gain**. (The latter has a different unit.)

With the default values, an operation of the motor is possible; for optimal adaptation to the conditions of the machine, the parameter S-0-0100 must still be optimized.

P-7-4037 - Attributes

Para. Name:	**DE**	Drehzahlregler-Prop.verst. Default		
	EN	Velocity loop prop. gain, default		
	FR	Gain prop. de l'asservissement de vitesse, défaut		
	ES	Amplificacion prop. de regulador de velocidad, default		
	IT	Guadagno prop. Anello di Velocità, Default		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		mAs/rad	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-7-4038, Velocity loop integral action time, default

The default value for the velocity loop integral action time. The parameter is set at the factory and cannot be changed. With the „default parameter load", the value of the parameter will be copied into the parameter **S-0-0101, Velocity loop integral action time**.

With the default values, an operation of the motor is possible; for optimal adaptation to the conditions of the machine , the parameter S-0-0101 must still be optimized.

P-7-4038 - Attributes

Para. Name:	**DE**	Drehzahlregler-Nachstellzeit Default		
	EN	Velocity loop integral action time, default		
	FR	Part intégrale de l'asservissement de vitesse, défaut		
	ES	Tiempo de reajuste de regulador de velocidad, default		
	IT	Tempo Integrazione Anello di Velocità, Default		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		ms	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-7-4039, Current loop prop. gain, default

The default value for the current loop proportional gain. The parameter will set in the factory and cannot be changed. With the „default parameter load", the value of the parameter will be copied into the parameter **S-0-0106, Current loop proportional gain 1**.

The current loop gain is already optimized and may not be changed.

P-7-4039 - Attributes

Para. Name:	**DE**	Stromregler-Prop.verst. Default		
	EN	Current loop prop. gain, default		
	FR	Gain prop. de l'asservissement de courant, défaut		
	ES	Regulador de corriente amplificacion proporcional, default		
	IT	Guadagno prop. Anello di Corrente, Default		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		V/A	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-7-4042, Speed control smoothing time, default

The default value for the velocity loop delay time. The parameter is set at the factory and cannot be changed. With the "default parameter load", the value of the parameter will be copied into the parameter **P-0-0004, Velocity loop smoothing time constant**.

P-7-4042 - Attributes

Para. Name:	**DE**	Drehzahlregler-Glättungszeitkonst. Default		
	EN	Speed control smoothing time, default		
	FR	Temps de filtrage vitesse, défaut		
	ES	Constante temporal de alisamiento, default		
	IT	Tempo di Smorzamento Velocità, Default		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		us	**Extrem value check:**	no
Decimal places:		0	**Combination check:**	no
Input min/max:		250 / 65500		
Default value:		---	**Cyc. transmittable:**	no

P-7-4047, Motor inductance

Inductance of the motor, measured between two clamps.

The parameter is set at the factory and cannot be changed.

P-7-4047 - Attributes

Para. Name:	**DE**	Motor-Induktivität		
	EN	Motor inductance		
	FR	Inductance moteur		
	ES	Inductividad de motor		
	IT	Induttanza Motore		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		mH	**Extrem value check:**	no
Decimal places:		2	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

P-7-4049, Current loop integral action time, default

The default value for the current loop integral action time. The parameter is set at the factory and cannot be changed. With the "default parameter load", the value of the parameter will be copied into the parameter **S-0-0107, Current regulator 1 integral action time**.

The current loop integral action time is already optimized and may not be changed any more.

P-7-4049 - Attributes

Para. Name:	**DE**	Stromregler-Nachstellzeit Default		
	EN	Current loop integral action time, default		
	FR	Part intégrale de l'asservissement de courant, défaut		
	ES	Tiempo de reajuste de regulador de corriente, default		
	IT	Tempo Integrazione Anello di Corrente, Default		
Function:		Parameter	**Editability:**	no
Data length:		2Byte	**Memory:**	Feedb. EE
Format:		DEC_OV	**Validity check:**	no
Unit:		ms	**Extrem value check:**	no
Decimal places:		1	**Combination check:**	no
Input min/max:		0 / 65535		
Default value:		---	**Cyc. transmittable:**	no

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DIAX03
Drive With Servo Function

Supplement B
Diagnostic message description
SSE 02VRS

DOK-DIAX03-SSE-02VRS**-FKB1-EN-P

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Notes

1 Diagnostic Message Descriptions

1.1 Overview of the diagnostic message descriptions

Diagnostic Message Types

Each operational state of the drive will be characterized with a diagnostic message.

Differentiations will be made between:

- **Error diagnostic messages**
- **Warning diagnostic messages**
- **Command diagnostic messages**
- **Drive Mode diagnostic messages**
- **Operation status**

Construction of a diagnostic message

A diagnostic message consists of:

- **A diagnostic number** and a
- **diagnostic text**

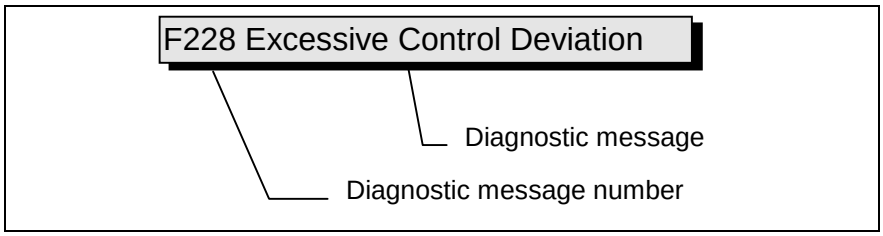

Fig. 1-1: Diagnostic message with a diagnostic number and text.

For the example in the graphic, "F2" and "28" are shown alternately on the H1-Display.

The control system can read out the diagnostic number in hexadecimal form with the **S-0-0390, Diagnostic message number** parameter.

In addition, the drive allocates to the control system the diagnostic number and diagnostic text as a string **F228 Excessive deviation** with the **S-0-0095, Diagnostic message** parameter.

H1-Display

The H1-Display serves as an optical display of the diagnostic message on the drive.

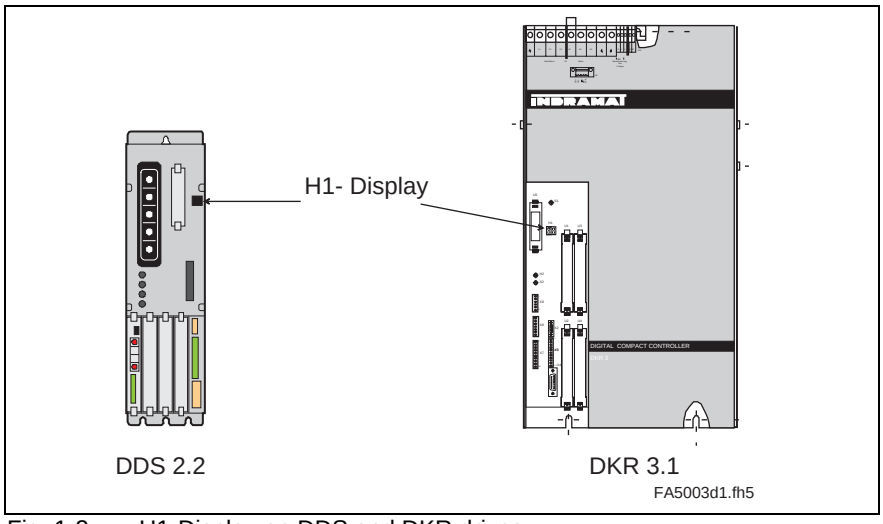

Fig. 1-2: H1-Display on DDS and DKR drives

The diagnostic number appears on this two-positional seven-segment display. The image can be seen on the "Diagnostic Message Priority Display".

This display quickly shows the current operation status without the use of a communications interface.

The operating mode cannot be seen from the H1-Display. If the drive follows the operating mode and no command was activated, then the symbol "AF" appears on the display.

Diagnostic Message Output Priority

If more than one diagnostic message is waiting, then the message with the highest priority will be displayed.

The following graphic classifies operation status in order of importance.

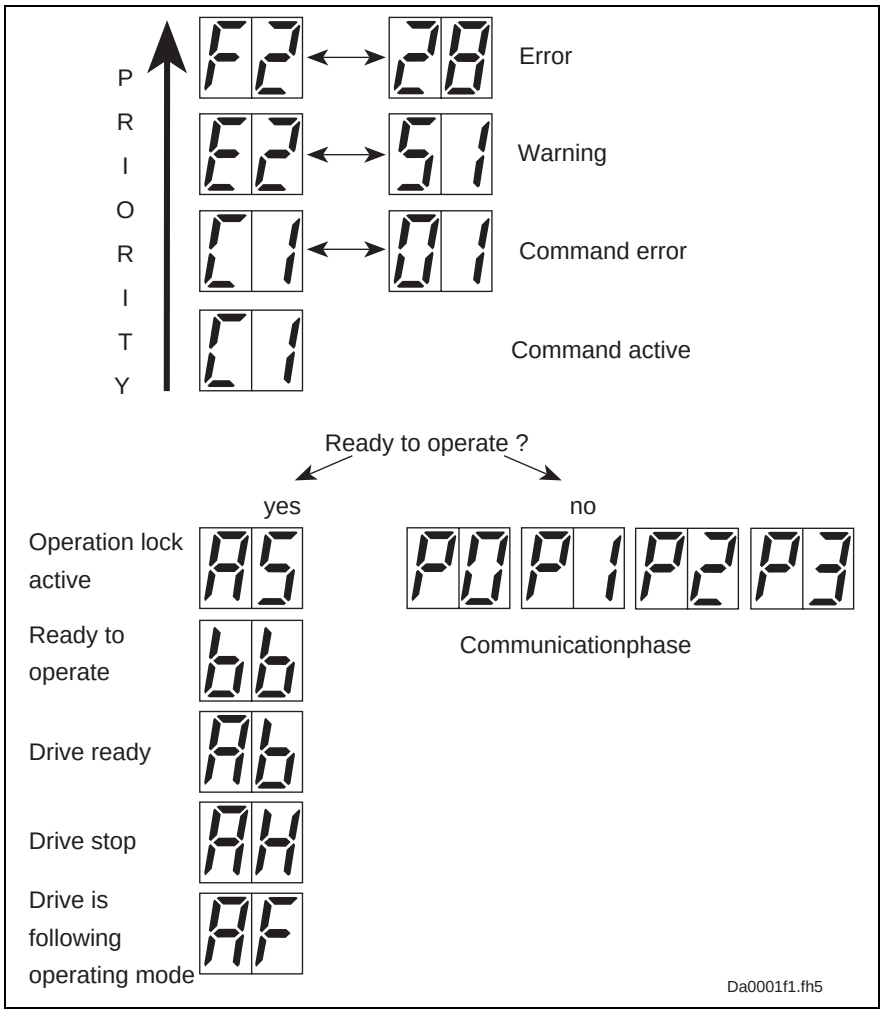

Fig. 1-3: Diagnostic message priority diagram

Clear Coded Diagnostic Message

The clear coded diagnostic message contains the diagnostic number followed by the diagnostic text, as shown in the example, "Excessive Output Error" (Fig. 1-1). It can be read out with the **S-0-0095, Diagnostic message** parameter and directly displays the operation status on an operator surface.

The clear coded diagnostic message will be switched to the current language.

Notes

1.2 Error diagnostic messages

F207 Switching to uninitialized Operation Mode

Cause:

0 has been selected in at least one of the four mode parameters **S-0-0032..35**. This mode was selected by the bits 8 and 9 in the master control word when the drive controller was on.

Remedy:

Enter the required mode in the activated mode parameter.

Valid modes are:

Meaning:	**Bit list of the mode parameters:**
Torque control	0000 0000 0000 0001
Velocity control	0000 0000 0000 0010
Position control with act. feedback val. 1	0000 0000 0000 x011
Position control with act. feedback val. 2	0000 0000 0000 x100
Drive-internal interpolation with actual feedback value 1	0000 0000 0001 x011
Drive-internal interpolation with actual feedback value 2	0000 0000 0001 x100
Relative drive-internal interpolation with actual feedback value 1	0000 0010 0001 x011
Relative drive-internal interpolation with actual feedback value 2	0000 0010 0001 x100

Fig. 1-4: Modes

Parameter:	Primary mode of operation	S-0-0032
	Secondary operation mode 1	S-0-0033
	Secondary operation mode 2	S-0-0034
	Secondary operation mode 3	S-0-0035

Check for input of the permissible interpolation method.

See also the functional description: "Setting the operating mode parameters"

F207 - Attributes

H1 Display : F2/07

Diag. mess.: **DE** F207 Umschaltung auf nicht initialisierte Betriebsart
EN F207 Switching to uninitialized Operation Mode
FR F207 Changement à un mode d'opération non initialisé
ES F207 Conmutación a modo de servicio no inicializado
IT F207 Selezione di un Modo Operativo non inizializzato

Mess. no.: F207 (hex)

Error no: 207

Class: Not fatal

F208 UL The motor type has changed.

Description:

The settings for current regulation, velocity command, and position loop are stored in the feedback of the motor. After powering up, the drive compares the motor type stored in the parameters with the connected motor type. If the two do not match, the drive remains in this state.

By pressing the S1 key, the drive overwrites its stored parameters with the control loop parameters from the motor feedback.

Cause:

The motor has been exchanged.

A parameter file has been loaded, but the parameter **P-0-4036, Contacted motor type** contained a different motor type.

Remedy:

Command **C700 Basic Load** or press the S1 button.

See also the functional description: "Automatic execution of the load default feature"

F208 - Attributes

H1 Display :		UL
Diag. mess.:	**DE**	F208 UL Der Motortyp hat sich geändert.
	EN	F208 UL The motor type has changed.
	FR	F208 UL Le type de moteur a changé.
	ES	F208 UL El tipo de motor ha cambiado.
	IT	F208 UL Cambiato Tipo di Motore
Mess. no.:		F208 (hex)
Error no:		208
Class:		Not fatal

F209 PL Load parameter default values

Description:

After the firmware is replaced (EPROMs), if the parameters have been changed in regards to the old product, the drive displays “**PL**”. By pressing the S1 button on the drive or by starting the command “load basic parameters”, all the parameters will be erased and restored with the default values.

Cause:

Product was replaced. The number of parameters in comparison to the new products has changed.

Remedy:

Press S1 button on the drive controller and all the paramters will be erased and restored with default values

WARNING

⇒ This overwrites all parameters and positioning blocks.

See also the functional description: "Basic parameter block"

F209 - Attributes

H1 Display : PL

Diag. mess.:
DE F209 PL Defaultwerte der Parameter laden
EN F209 PL Load parameter default values
FR F209 PL Charger les valeurs init. des paramètres
ES F209 PL Cargar valores init.
IT F209 PL Caricare le Valori init. dei Parametri

Mess. no.: F209 (hex)

Error no: 209

Class: Not fatal

F218 Amplifier Overtemp. shutdown

Description:

The temperature of the DKC heatsink will be monitored. If the temperature of the heatsink is too high, the drive will power down in order to protect against damage.

Cause:

1. Ambient temperature is too high. The specified operational data is valid up to an ambient temperature of 45°C.
2. The DKC's heatsink is dirty.
3. Air flow is prevented by other assembly parts or a control cabinet panel assembly.
4. Heatsink blower may be defective

Remedy:

For 1. Reduce the ambient temperature; for example, through cooling of the control cabinet

For 2. Remove any obstruction or dirt from the heatsink.

For 3. Install the device vertically and clear a large enough area for proper heatsink ventilation.

For 4. Exchange drive.

F218 - Attributes

H1 Display : F2/18

Diag. mess.:
DE F218 Verstärker-Übertemp.-Abschaltung
EN F218 Amplifier Overtemp. shutdown
FR F218 Surchauffe ampli
ES F218 Desconexión por exceso de temperatura de amplificador
IT F218 Spegnimento per Sovratemp. Dissapatore

Mess. no.: F218 (hex)

Error no: 218

Class: Not fatal

F219 Motor Overtemp. shutdown

If the motor temperature exceeds the value in **S-0-0204, Motor shutdown temperature**, the drive will generate this error message. The value in **S-0-0204** is fixed at 150°C for MDD-,MKD- and MKE motors. The appropriate value must be entered from the motor's technical specifications for all other types of motors.

For motors of series: 2AD, 1MB, LAF, LAR, and MBW, the current motor temperature can be called up with parameter **S-0-0383, Motor temperature**.

Cause:

1. The motor became overloaded. The effective torque demand on the motor was above its permissible continuous torque level for too long.
2. Short circuit or ground in the connection to motor temperature monitoring.
3. Instability in the velocity control loop.

Remedy:

For 1. Check the layout of the motor. For motors which have been in operation for longer periods of time, check to see if the operating conditions have changed (in regards to cleanliness, friction, moved components, etc.).

For 2. Check the wiring to the motor temperature monitor X6/1 and X6/2 for grounds and short circuits.

For 3. Check the velocity control loop parameters (see the functional description).

See also the functional description: "Temperature monitoring"

F219 - Attributes

H1 Display :		F2/19
Diag. mess.:	**DE**	F219 Motor-Übertemp.-Abschaltung
	EN	F219 Motor Overtemp. shutdown
	FR	F219 Surchauffe moteur
	ES	F219 Desconexión por exceso de temperatura de motor
	IT	F219 Spegnimento per Sovratemp. Motore
Mess. no.:		F219 (hex)
Error no:		219
Class:		Not fatal

F221 Error Motor temp. surveillance defective

Cause:

Short-circuit in the wiring to the motor temperature monitoring.

Remedy:

Check the wiring to the motor temperature monitoring X6/1 and X6/2 for short-circuits.

See also the functional description: "Temperature monitoring"

F221 - Attributes

H1 Display : F2/21

Diag. mess.:
DE F221 Fehler Motor-Temp.überwachung defekt
EN F221 Error Motor temp. surveillance defective
FR F221 Erreur dans la surveillance température moteur
ES F221 Error control de temperatura de motor defectuos
IT F221 Errore nel Controllo della Temperatura Motore

Mess. no.: F221 (hex)

Error no: 221

Class: Not fatal

F226 Undervoltage in power section

The DC bus voltage is monitored in the power supply module. The drive controller is notified via the control voltage bus whether the DC bus voltage is above a minimum permissible value. If the CD bus voltage falls below that threshold, the DC bus voltage message will be removed by the power supply unit and the selected **P-0-0119, Best possible deceleration** will be performed.

Requirement: The **P-0-0118, Power off on error** parameter has been set such that the undervoltage condition is handled as a fault.

Cause:

1. The power is switched off without having de-activated the drive via the controller enabling signal (RF) before.
2. The drive has been activated via the controller enabling signal (RF) without having activated the power section before.
3. Malfunction of the power supply unit.

Remedy:

Ref. 1.+2. Checking the logic that is used for activating the drive in the connected controller.

Ref. 3. Eliminate the malfunction of the power supply unit. See Applications Manual of the power supply unit.

See also the functional description: "Controller enable"

F226 - Attributes

H1 Display : F2/26

Diag. mess.:
DE F226 Unterspannung im Leistungsteil
EN F226 Undervoltage in power section
FR F226 Sous-tension puissance
ES F226 Tensión baja en parte de potencia
IT F226 Errore Alimentazione bassa nello Stadio di Potenza

Mess. no.: F226 (hex)

Error no: 226

Class: Not fatal

F228 Excessive Deviation

When the position loop is closed, the drive monitors whether it is able to follow the specified command value. This is done by calculating a model position value in the drive and comparing that value with the actual feedback value. This error is generated if the difference between theoretical and actual position value permanently exceeds the value of the **S-0-0159, Monitoring window** parameter.

Cause:

1. The drive's acceleration capacity is exceeded.
2. The axis is blocked.
3. Incorrect parameter values set in the drive parameters.
4. Incorrect parameter values in **S-0-0159, Monitoring window**
5. The power supply has been switched of while the controller enabling signal is applied. Possible cause: Malfunction in an AC servo drive at the common power supply module.

Remedy:

Ref. 1. Check the **S-0-0092, Bipolar torque/force limit value** parameter and set it to the maximum permissible value of the application. Reduce the specified acceleration value from the controller (see controller Manual).

Ref. 2. Check the mechanical system and eliminate jamming of the axis.

Ref. 3. Check the drive parameters.

Ref. 4. Set the parameter values of **S-0-0159, Monitoring window**.

Ref. 5. Check AC servo drive with error message different than "28".

See also the functional description "Position control loop monitoring".

F228 - Attributes

H1 Display : F2/28

Diag. mess.:
DE F228 Exzessive Regelabweichung
EN F228 Excessive Deviation
FR F228 Déviation de posit. excessive
ES F228 Desviación de regulación excesiva
IT F228 Deviazione eccessiva

Mess. no.: F228 (hex)

Error no: 228

Class: Not fatal

F229 Motor Encoder Failure: Quadrant Error

A hardware error was discovered in the motor encoder interface being used.

Cause:

1. Defective encoder cable.
2. Disruptive electro-magnetic interference on the encoder cable.
3. Defective motor encoder interface.
4. Defective drive controller.

Remedy:

For 1. Exchange the encoder cable.

For 2. Keep the encoder cable well away from the power cables.

For 3. Exchange the motor encoder interface.

For 4. Exchange the drive controller.

F229 - Attributes

H1 Display : F2/29

Diag. mess.: **DE** F229 Motorgeberfehler: Quadrantenfehler
EN F229 Motor Encoder Failure: Quadrant Error
FR F229 Erreur codeur moteur: erreur de quadrant
ES F229 Error de encoder de motor: error de cuadrante
IT F229 Errore Encoder Motore: Errore Quadrante

Mess. no.: F229 (hex)

Error no: 229

Class: Not fatal

F233 External Power Supply Error

Cause:

The DEA plug-in modules have isolated inputs and outputs. Proper operation of those inputs and outputs requires an external 24-V voltage to be applied. The drive monitors that voltage as soon as a DEA plug-in module has been installed.

Remedy:

Check the external 24-V power supply.

Name:	Unit:	min.:	typ.:	max.:
External operating voltage $+U_L$	V	18	24	32
External current consumption I_L	mA			100

Fig. 1-5: External power supply

See also the functional description: "Digital I/O Functional Principle"

F233 - Attributes

H1 Display : F2/33

Diag. mess.:
DE F233 Fehler Spannungsversorgung extern
EN F233 External Power Supply Error
FR F233 Erreur dans l'alimentation externe
ES F233 Error de suministro de potencia externa
IT F233 Errore Alimentatore esterno

Mess. no.: F233 (hex)

Error no: 233

Class: Not fatal

F236 Excessive Position Feedback Difference

Cause:

In the communication phase 4 transition check command, position feedback value 1 and position feedback value 2 are set to the same value and the cyclic evaluation of both encoders is started. In cyclic operation (phase 4), the position feedback difference of both encoders is compared with **S-0-0391, Monitoring window ext. feedback**. If the amount of the difference exceeds the monitoring window, error **F236 Excessive position feedback difference** is diagnosed, the parameter-selected error response performed, and the reference bits of both encoders are cleared.

1. Incorrect parameter for the external encoder (**S-0-0115, Position feedback 2 type parameter, S-0-0117, Resolution of external feedback**).
2. Incorrect parameter setting of mechanical system between motor shaft and external encoder. (**S-0-0121, Input revolutions of load gear**; **S-0-0122, Output revolutions of load gear** **S-0-0123, Feed constant**).
3. The mechanical system between motor shaft and external encoder is not rigid (e.g. gear play).
4. Defective encoder cable.
5. Defective module (DLF or DEF) for the evaluation of the external measuring system.
6. Maximum input frequency of the encoder interface exceeded.
7. External encoder is not mounted to the driven axis.
8. Incorrect reference dimension of an absolute encoder.

Remedy:

Ref. 1. Check **S-0-0115, Position feedback 2 type parameter** and **S-0-0117, Resolution of external feedback**

Ref. 2. Check **S-0-0121, S-0-0122, Input/Output revolutions of load gear** and **S-0-0123, Feed constant**

Ref. 3. Increase **S-0-0391, Monitoring window ext. feedback**.

Ref. 4. Replace encoder cable.

Ref. 5. Replace module for the evaluation of the external measuring system.

Ref. 6. Reduce the velocity.

Ref. 7. Set **S-0-0391, Monitoring window ext. feedback** to 0 (de-activate monitoring function)

Ref. 8. Perform **P-0-0012, C300 Command 'Set absolute measurement'.**

See also the functional description "Actual feedback value monitoring"

F236 - Attributes

H1 Display : F2/36

Diag. mess.:
DE F236 Exzessive Lageistwertdifferenz
EN F236 Excessive Position Feedback Difference
FR F236 Différence excessive en position réelle
ES F236 Diferencia excesiva de valor real de posición
IT F236 Eccessiva diff. nel Feedback di Posizione

Mess. no.: F236 (hex)

Error no: 236

Class: Not fatal

F237 Excessive Position Command Difference

Cause:

When the drive is operating in position control, position command values which come via the SERCOS interface are monitored. If the velocity required of the drive by two successive position command values is greater than or equal to the value in **S-0-0091, Bipolar velocity limit value**, position command value monitoring is initiated. The **Excessive position command value** is stored in parameter **P-0-0010**. The **last valid position command value** is stored in parameter **P-0-0011**.

If position data are to be processed in modulo format, then the interpreation of the command values is also dependent on the value set in **S-0-0393, Command value mode for modulo format.** The parameter should be set for the "shortest path" (0).

Remedy:

Compare S-0-0091, Bipolar velocity limit value with the velocity in the program and adjust to match it, if necessary.

See also the functional description: "Position command value monitoring"

F237 - Attributes

H1 Display : F2/37

Diag. mess.:
DE F237 Exzessive Lagesollwertdifferenz
EN F237 Excessive Position Command Difference
FR F237 Différence excessive en position consigne
ES F237 Diferencia excesiva de valor nominal de posición
IT F237 Eccessiva diff. nella Posizione comandata

Mess. no.: F237 (hex)

Error no: 237

Class: Not fatal

F242 External Encoder Failure: Signal too small

Cause:

The analog signals of an external measurement system are used for high resolution analysis of that measurement system. These are monitored according to two criteria:

1. The pointer length, which is calculated from the sine and cosine signals, must be at least 1 V.
2. The maximum pointer length resulting from the sine and cosine signals must not exceed 11.8 V.

$$\text{pointer length} = \sqrt{\sin^2 + \cos^2}$$

Fig. 1-6: Pointer length

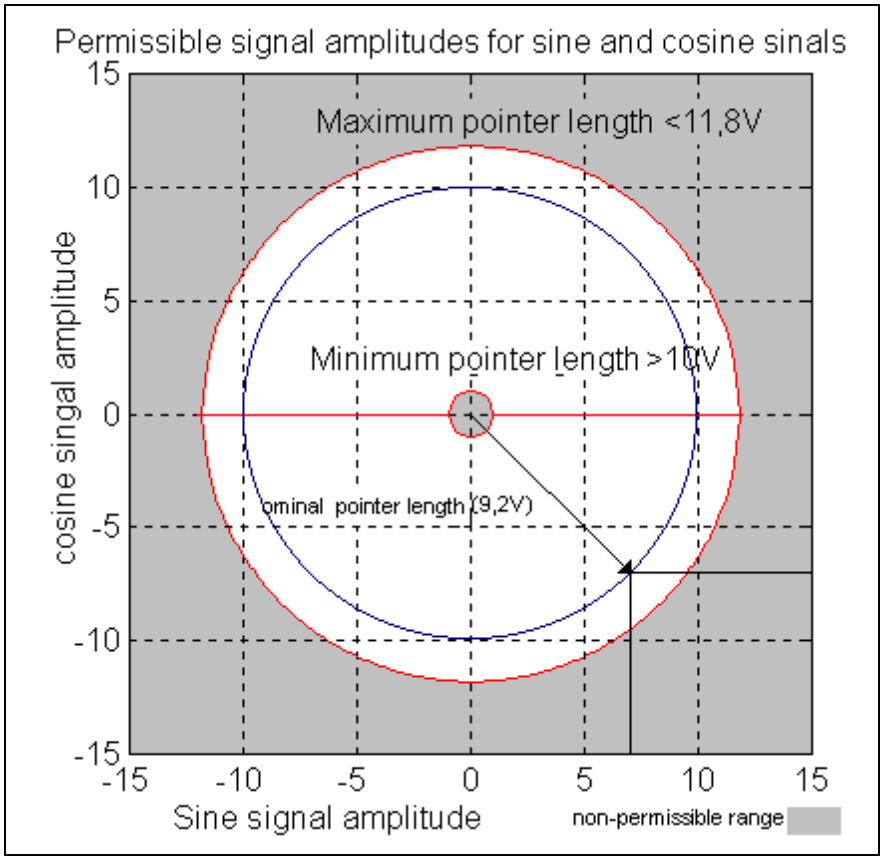

Fig. 1-7: Correct signal amplitude

Example:

Ucos = -6.5V

Usin = 6.5V

$$\text{pointer length} = \sqrt{(-6.5\text{V})^2 + 6.5\text{V}^2} \approx 9.2\text{V}$$

Remedy:

1. Check the measurement system cable.
2. Check the measurement system.

F242 - Attributes

H1 Display : F2/42

Diag. mess.:
DE F242 Fehler des ext. Gebers: Signalamplitude fehlerhaft
EN F242 External Encoder Failure: Signal too small
FR F242 Erreur codeur externe: signal trop faible
ES F242 Error del encoder ext.: señal demasiado pequeña
IT F242 Errore Encoder esterno: Ampiezza troppo bassa

Mess. no.: F242 (hex)

Error no: 242

Class: Not fatal

F245 External Encoder Failure: Quadrant Error

A hardware error was discovered in the high resolution position interface for "DLF" sine signals of the external measurement system.

Cause:

1. Defective encoder cable.
2. Disruptive electro-magnetic interference on the encoder cable.
3. Defective DLF module.

Remedy:

For 1. Exchange the encoder cable.

For 2. Keep the encoder cable well away from the power cables.

For 3. Exchange the DLF module.

F245 - Attributes

H1 Display : F2/45

Diag. mess.:
DE F245 Fehler des ext. Gebers: Quadrantenfehler
EN F245 External Encoder Failure: Quadrant Error
FR F245 Erreur codeur externe: erreur de quadrant
ES F245 Error del encoder ext.: error de cuadrante
IT F245 Errore Encoder esterno: Errore di Quadrante

Mess. no.: F245 (hex)

Error no: 245

Class: Not fatal

F248 Low Battery Voltage

Cause:

For motors of series MKD and MKE, the absolute position information is stored by a battery-powered buffer in the motor feedback. The battery is designed for a 10-year life span. If the battery voltage falls below 2.8 V, this message appears. The absolute encoder function will still be preserved for about 2 weeks.

CAUTION

Source of danger:	Malfunction in the control of motors and moving elements
Possible damages:	Mechanical injuries
Precautionary measures:	Replace the battery as soon as possible

Instructions for Exchanging Batteries

Have the following tools and accessories ready:

- Torx screwdriver size 10
- Needle-nose pliers, torque wrench
- New packaged battery (Part No.: 257101)

CAUTION

Source of danger:	A malfunction in the control of motors and moving elements
Possible damages:	Mechanical injuries
Precautionary measures:	Turn off the power supply. Make sure it will not be turned back on.
	Exchange the battery while the control voltage is turned on.

If the control voltage is turned off while the battery is taken out, the absolute reference point will be lost.

The reference point must then be reestablished.

Removing the Battery

- Unscrew torx screw with a size 10 screwdriver.
- Pull out the resolver feedback (RSF) lid by hand.
- Pull off the battery connection.
- Loosen battery clamp and remove the battery.
- Place the factory-made battery (Part No.: 257101) in the housing and screw on the clamp. **WARNING!** Do not kink the battery cable.
- Attach connection to the battery.

Close the resolver feedback lid, screw in 4 torx screws and tighten to 1.8 Nm with the torque wrench.

F248 - Attributes

H1 Display :		F2/48
Diag. mess.:	**DE**	F248 Batterie-Unterspannung
	EN	F248 Low Battery Voltage
	FR	F248 Sous-tension batterie
	ES	F248 Batería baja
	IT	F248 Tensione Batteria bassa
Mess. no.:		F248 (hex)
Error no:		248
Class:		Not fatal

F267 Erroneous internal Hardware Synchronization

Cause:

The drive control of all drives in a SERCOS ring is synchronized by a phase control loop. Proper functioning of the synchronization is monitored. This error is generated if the average deviation is greater than 5 usec.

Remedy:

- Exchange DSS module.
- Exchange the drive controller.

F267 - Attributes

H1 Display :		F2/67
Diag. mess.:	**DE**	F267 Hardware-Synchronisation fehlerhaft
	EN	F267 Erroneous internal Hardware Synchronization
	FR	F267 Faute de synchronisation du matériel interne
	ES	F267 Sincronización de hardware interno defectuosa
	IT	F267 Sincronizz. Hardware interna errata
Mess. no.:		F267 (hex)
Error no:		267
Class:		Not fatal

F268 Brake Fault

The drive controller takes control of the brake for motors with an integrated holding brake. The braking current is monitored.
If the braking current is outside of the permissible range between:

0.4 -1.6 * **P-0-0511, Break current**

this error message will be generated.

Cause:

1. The power supply for the brake is not connected properly or is outside of the (24 V +/- 10%) tolerance.
2. The motor cable is incorrectly connected (wiring error).
3. Defective brake.
4. Defective drive controller.

Note: A metallic connector between the 0V brake supply and the 0V of the drive controller is required.

Remedy:

For 1. Check the power supply.

For 2. Check the motor cable.

For 3. Exchange the motor.

For 4. Exchange the drive controller.

See also the functional description: "Setting the motor brake current"

F268 - Attributes

H1 Display : F2/68

Diag. mess.:
DE F268 Fehler Bremse
EN F268 Brake Fault
FR F268 Erreur du frein
ES F268 Fallo freno
IT F268 Errore Freno

Mess. no.: F268 (hex)

Error no: 268

Class: Not fatal

F270 Error power supply home switch

To be able to monitor the home switch in drive-controlled homing, the DSS2.1 plug-in module requires an external 24-V power supply. The drive monitors the external 24-V power supply if homing with home switch has been selected via **S-0-0147, Homing parameter** (bit 5).

Cause:

The external 24-V power supply of the DSS2.1 plug-in module is missing.

Remedy:

1. Set **S-0-0147, Homing parameter** to "Homing without home switch" (bit 5 = 1).
2. Check the 24-V power supply at connector X12 of the DSS2.1 module.

Name:	Unit:	min.:	typ.:	max.:
External operating voltage $+U_L$	V	18	24	32
External current consumption I_L	mA			100

Fig. 1-8: External power supply

See also the functional description: "Connection and Configuration of the Home switch"

F270 - Attributes

H1 Display : F2/70

Diag. mess.:
DE F270 Fehler Spannungsversorgung Nullschalter
EN F270 Error power supply home switch
FR F270 Erreur de l'alimentation du contact d'origine
ES F270 Error suministro de potencia de contacto cero
IT F270 Guasto nell'Alimentazione del interruttore di Zero

Mess. no.: F270 (hex)

Error no: 270

Class: Not fatal

F271 Error power supply travel limit switch

To be able to monitor the travel limit switches, the DSS2.1 plug-in module requires an external 24-V power supply. The drive monitors the external 24-V power supply if the travel limit switches have been activated via the **P-0-0090, Travel limit parameter**.

Cause:

The external 24-V power supply of the DSS2.1 plug-in module is missing.

Remedy:

1. De-activate **P-0-0090, Travel limit parameter**.
2. Check the 24-V power supply at connector X12 of the DSS2.1 module.

See also the functional description: "Travel Zone End Switches - Activation and Polarity"

F271 - Attributes

H1 Display :		F2/71
Diag. mess.:	**DE**	F271 Fehler Spannungsversorgung Fahrbereichsgrenzschalter
	EN	F271 Error power supply travel limit switch
	FR	F271 Erreur de l'alimentation des fins de course
	ES	F271 Error suministro de potencia de fin de carrera
	IT	F271 Guasto nell'Alimentazione Finecorsa
Mess. no.:		F271 (hex)
Error no:		271
Class:		Not fatal

F272 Error power supply probe input

The probe inputs of the DSS2.1 plug-in module require an external 24-V power supply. The drive monitors the external 24-V power supply if the probes are activated via the **S-0-0170, Probing cycle procedure command**.

Cause:

The external 24-V power supply of the DSS2.1 plug-in module is missing.

Remedy:

Connect the 24-V power supply to the connector X12 of the DSS2.1 module.

See also the functional description: "Connecting the Probe Inputs"

F272 - Attributes

H1 Display :		F2/72
Diag. mess.:	**DE**	F272 Fehler Spannungsversorgung Meßtaster
	EN	F272 Error power supply probe input
	FR	F272 Erreur de l'alimentation de la sonde
	ES	F272 Error suministro de potencia de la sonda
	IT	F272 Guasto nell'Alimentazione del Probe
Mess. no.:		F272 (hex)
Error no:		272
Class:		Not fatal

F273 Error power supply E-Stop

The emergency stop input of the DSS2.1 plug-in module requires an external 24-V power supply. The drive monitors the external 24-V power supply if the emergency stop function is activated via the **P-0-0008, Activation E-Stop-Function** parameter.

Cause:

The external 24-V power supply of the DSS2.1 plug-in module is missing.

Remedy:

1. Connect 24-V power supply to the connector X12 of the DSS2.1 module.
2. Use the **P-0-0008, Activation E-Stop-function** parameter to de-activate the emergency stop function.

See also the functional description: "Connection of the Emergency-Stop Input"

F273 - Attributes

H1 Display :		F2/73
Diag. mess.:	**DE**	F273 Fehler Spannungsversorgung E-Stop
	EN	F273 Error power supply E-Stop
	FR	F273 Erreur de l'alimentation pour l'arrêt d'urgence
	ES	F273 Error suministro de potencia para parada de emergencia
	IT	F273 Guasto nell'Alimentazione dello Stop Emergenza
Mess. no.:		F273 (hex)
Error no:		273
Class:		Not fatal

F276 Absolute encoder out of allowed window

When a drive controller with an absolute encoder motor (multiturn) is switched off, the actual feedback position is saved. When it is turned back on, the position determined by the absolute encoder evaluation is compared with this stored position. This error is given if the deviation is greater than the value set by parameter in **P-0-0097, Absolute encoder control window**.

Cause:

1. Turning on for the first time (invalid stored position).
2. The axis was moved further in switched-off state than allowed by parameter **P-0-0097, Absolute encoder monitoring window**.
3. Incorrect position initialization.

Remedy:

For 1. Clear the error and set the reference point.

For 2. The axis was moved while turned off and is located outside of its permissible position.
Check to see if a new travel command would cause damage.
Then clear errors.

For 3. **Danger of Accident through Unwanted Axis Motion**
Check reference point. If the reference point is incorrect, there is a problem with the feedback. The feedback should be exchanged (with MDD-, MKD- or MKE absolute motor encoders, exchange the whole motor).

See also the functional description: "Absolute encoder monitoring"

F276 - Attributes

H1 Display :		F2/76
Diag. mess.:	**DE**	F276 Absolutgeber außerhalb des Überwachungsfensters
	EN	F276 Absolute encoder out of allowed window
	FR	F276 Codeur absolu hors du fenêtre de surveillance
	ES	F276 Encoder absoluto fuera de la ventana de control
	IT	F276 Encoder Assoluto fuori Finestra
Mess. no.:		F276 (hex)
Error no:		276
Class:		Not fatal

F280 Short circuit to earth

Cause:

Ground short in the DC bus or in the motor.

This error is reported only in compact devices.

Remedy:

- Isolation test of the motor and motor power supply cable.

- Disconnect the power supply cable from the motor to the drive and turn on the drive and the power. If the error recurs, the drive should be exchanged.

F280 - Attributes

H1 Display : F2/80

Diag. mess.:
DE F280 Erdschluss
EN F280 Short circuit to earth
FR F280 Court circuit à la terre
ES F280 Cortocircuito a tierra
IT F280 Corto a Terra

Mess. no.: F280 (hex)

Error no: 280

Class: Not fatal

F281 Mains fault

Cause:
The power supply voltage was not present during operation for at least 3 power periods. As a result, the drive controller was brought to a standstill according to the set error response.

Remedy:

Check the power supply connection according to the project planning specifications.

F281 - Attributes

H1 Display : F2/81

Diag. mess.:
DE F281 Netzausfall
EN F281 Mains fault
FR F281 Alimentation puissance manque
ES F281 Fallo de red
IT F281 Errore Alimentazione Potenza

Mess. no.: F281 (hex)

Error no: 281

Class: Not fatal

F282 Phase loss fault

The power supply voltage is checked each time the control voltage is switched on and each time the controller enable is switched off. A phase error was found during this check.

Cause:

A power supply phase has failed or is outside of the permissible tolerance.

Remedy:

Check the power supply connection according to the project planning specifications of the drive controller being used.

F282 - Attributes

H1 Display : F2/82

Diag. mess.:
DE F282 Phasenfehler
EN F282 Phase loss fault
FR F282 Erreur de phase dans l'alimentation puissance
ES F282 Fallo de fase
IT F282 Errore Fasi Alimentazione

Mess. no.: F282 (hex)

Error no: 282

Class: Not fatal

F283 Line voltage fault

Cause:

The power supply voltage is above the permissible value > 460V+15%

Remedy:

Make sure the power supply is connected properly according to the project planning specifications of the drive controller being used.

F283 - Attributes

H1 Display : F2/83

Diag. mess.:
DE F283 Netzspannungsfehler
EN F283 Line voltage fault
FR F283 Tension alimentation puissance faux
ES F283 Sobretensión de red
IT F283 Sovratensione Alimentazione

Mess. no.: F283 (hex)

Error no: 283

Class: Not fatal

F284 Main contactor off, low voltage

Cause:

When the main contactor was turned off, the DC bus voltage went below 400 V while controller enable was set.

Remedy:

Switch off the controller enable before switching off the main contactor.

F284 - Attributes

H1 Display : F2/84

Diag. mess.:
DE F284 Hauptschütz aus, Unterspannung
EN F284 Main contactor off, low voltage
FR
ES F284 Tensión baja contactor principal
IT F284 Teleruttore Principale spento, Tensione bassa

Mess. no.: F284 (hex)

Error no: 284

Class: Not fatal

F401 Double MST error shutdown

The master sync telegram was not received in the drive controller in two successive SERCOS cycles.

Cause:

1. Disruption in the LWL transmission line.
2. Too much attenuation in the light signal.
3. Malfunction in the SERCOS interface (general).

Remedy:

For 1. Check all LWL connections in the SERCOS ring.

For 2. Measure the attenuation in the LWL cable.

The maximum attenuation between TX and RX must not fall below 12.5 dB.

For 3. Exchange the SERCOS interface module in the drive controller.

See also the functional description: "SERCOS interface error"

F401 - Attributes

H1 Display :		F4/01
Diag. mess.:	**DE**	F401 Abschaltung zweifacher MST-Ausfall
	EN	F401 Double MST error shutdown
	FR	F401 MST manqué 2 fois
	ES	F401 Desconexión por error doble MST
	IT	F401 Spegnimento per doppia mancanza MST
Mess. no.:		F401 (hex)
Error no:		401
Class:		Interface

F402 Double MDT error shutdown

The master data message frame (MDT) has not been received in the drive in two consecutive SERCOS cycles.

Causes:

1. Fault in the fiber optics transmission line.
2. Excessive damping of the light signals.
3. Malfunction in the SERCOS interface (general).

Remedy:

Ref. 1. Check all fiber optics connections in the SERCOS loop.

Ref. 2. Measure the damping in the fiber optics cable.

The maximum damping between TX and RX may not be less than 12.5 dB.

Ref. 3. Replace the SERCOS interface module in the drive.

See also the functional description: "SERCOS interface error"

F402 - Attributes

H1 Display : F4/02

Diag. mess.:
DE F402 Abschaltung zweifacher MDT-Ausfall
EN F402 Double MDT error shutdown
FR F402 MDT manqué 2 fois
ES F402 Desconexión por error doble MDT
IT F402 Spegnimento per doppia mancanza MDT

Mess. no.: F402 (hex)

Error no: 402

Class: Interface

F403 Invalid Communication Phase Shutdown

An invalid communications phase was given by the SERCOS master module (phase > 4).

Cause:

Error in the SERCOS master module of the control system.

Remedy:

Consult the control system manufacturer.

See also the functional description: "SERCOS interface error"

F403 - Attributes

H1 Display : F4/03

Diag. mess.:
DE F403 Abschaltung ungültige Komm.-Phase
EN F403 Invalid Communication Phase Shutdown
FR F403 Phase de communication fausse
ES F403 Desconexión por fase de comunicación no válida
IT F403 Spegnimento per Fase di Comunicazione invalide

Mess. no.: F403 (hex)

Error no: 403

Class: Interface

F404 Error during Phase Progression

The prescribed order was not maintained during phase progression.

Cause:

Error in the SERCOS master module of the control system.

Remedy:

Consult the control system manufacturer.

See also the functional description: "SERCOS interface error"

F404 - Attributes

H1 Display : F4/04

Diag. mess.:
DE F404 Fehler bei Phasenhochschaltung
EN F404 Error during Phase Progression
FR F404 Erreur pendant progression de phase comm.
ES F404 Error durante progresión de fase
IT F404 Errore durante la Progressione delle Fasi

Mess. no.: F404 (hex)

Error no: 404

Class: Interface

F405 Error during Phase Regression

Switching back from a communication phase did not switch to phase 0.

Cause:

Malfunction in the SERCOS master module of the controller.

Remedy:

Contact the controller manufacturer.

See also the functional description: "SERCOS interface error"

F405 - Attributes

H1 Display : F4/05

Diag. mess.:
DE F405 Fehler bei Phasenrückschaltung
EN F405 Error during Phase Regression
FR F405 Erreur pendant regression de phase comm.
ES F405 Error en regresión de fase
IT F405 Errore durante la Regressione delle Fasi

Mess. no.: F405 (hex)

Error no: 405

Class: Interface

F406 Phase Switching without Ready Signal

The SERCOS master attempted a phase switch without waiting for the drive controller's ready signal.

Cause:

Error in the SERCOS master module of the control system.

Remedy:

Consult the control system manufacturer.

See also the functional description: "SERCOS interface error"

F406 - Attributes

H1 Display : F4/06

Diag. mess.:
DE F406 Phasenumschaltung ohne Bereitmeldung
EN F406 Phase Switching without Ready Signal
FR F406 Changement de phase sans signal prêt
ES F406 Conmutación de fase sin señal de listo
IT F406 Cambio Fasi senza Segnale di Pronto

Mess. no.: F406 (hex)

Error no: 406

Class: Interface

F434 Emergency-Stop

Pressing the emergency stop switch has caused the drive to perform the emergency stop function that was selected in the **P-0-0119, Best possible deceleration** parameter. Setting bit 15 of **S-0-0011, Class 1 diagnostics** causes an error message to be issued to the controller.

Cause:

The emergency stop switch was pressed.

Remedy:

Eliminate the malfunction that has caused the emergency switch to be actuated, and clear the error.

See also the functional description: "Emergency stop feature"

F434 - Attributes

H1 Display : F4/34

Diag. mess.:
DE F434 E-Stop aktiviert
EN F434 Emergency-Stop
FR F434 Arrêt d'urgence
ES F434 Parada de emergencia activada
IT F434 Stop per Emergenza

Mess. no.: F434 (hex)

Error no: 434

Class: Interface

F629 Positive Travel Limit exceeded

The drive received a command value which resulted in an axis position The drive has received a command value which has led to an axis position outside the positive travel range. The axis was brought to a standstill with the error response "Set velocity command value to zero". Bit 2 of paramater **P-0-0090, Travel limit parameter** is set for "Exceeding travel range is an error", or after exceeding the position limit a drive control command has been started (such as the drive-controlled homing procedure).

Cause:

S-0-0049, Positive position limit value exceeded.

Remedy:

1. **Check S-0-0049, Positive position limit value.**
2. Check the software limits of the control system.
3. Activate the axis after the error response.

Procedure:

- Clear the error.
- If the power supply was turned off, turn it back on.
- Move the axis into the permissible working range.

Note: Only such command values will be accepted which lead back into the allowed working range. With other command values, the drive will stop again. - The parameter **S-0-0057, Position window** defines a hysteresis for the travel limits.

See also the functional description: "Axis limit values".

F629 - Attributes

H1 Display :		F6/29
Diag. mess.:	**DE**	F629 Lagegrenzwert positiv überschritten
	EN	F629 Positive Travel Limit exceeded
	FR	F629 Limite de position positive dépassée
	ES	F629 Valor límite de posición positiva excedido
	IT	F629 Limite positiva massimo superato
Mess. no.:		F629 (hex)
Error no:		629
Class:		Nr. 1

F630 Negative Travel Limit exceeded

The drive has received a command value which has led to an axis position outside the negative travel range. The axis was brought to a standstill with the error response "Set velocity command value to zero". Bit 2 of paramater **P-0-0090, Travel limit parameter** is set for "Exceeding travel range is an error", or after exceeding the position limit a drive control command has been started (such as the drive-controlled homing procedure).

Cause:

S-0-0050, Negative travel limit value exceeded.

Remedy:

1. **Check S-0-0050, Negative travel limit value.**
2. Check the software limits of the control system.
3. Activate the axis after the error response.

Procedure:

- Clear the error.
- If the power supply was turned off, turn it back on.
- Move the axis into the permissible working range.

Note: Only such command values will be accepted which lead back into the allowed working range. With other command values, the drive will stop again. - The parameter **S-0-0057, Position window** defines a hysteresis for the travel limits.

See also the functional description: "Axis limit values".

F630 - Attributes

H1 Display : F6/30

Diag. mess.:
DE F630 Lagegrenzwert negativ überschritten
EN F630 Negative Travel Limit exceeded
FR F630 Limite de position négative dépassée
ES F630 Valor límite de posición negativa excedido
IT F630 Limite negativa massimo superato

Mess. no.: F630 (hex)

Error no: 630

Class: Travel range

F634 Emergency-Stop

Pressing the emergency stop switch has caused the drive to stop the drive by setting the velocity command value to zero. An error is reported in the **S-0-0011, Class 1 diagnostics** parameter.

Cause:

The emergency stop switch has been pressed.

Remedy:

Eliminate the malfunction that has caused the emergency switch to be actuated, and clear the error.

See also the functional description: "Emergency stop feature"

F634 - Attributes

H1 Display : F6/34

Diag. mess.:
DE F634 E-Stop aktiviert
EN F634 Emergency-Stop
FR F634 Arrêt d'urgence
ES F634 Parada de emergencia activada
IT F634 Stop per Emergenza

Mess. no.: F634 (hex)

Error no: 634

Class: Travel range

F643 Positive Travel Limit Switch detected

The positive travel limit switch was encountered. The axis was brought to a standstill with the "Set velocity command value to zero" error response. Bit 2 of parameter **P-0-0090, Travel limit parameter** is set for "Exceeding travel range as error," or exceeding the position limit began a drive control command (such as the drive-controlled homing procedure).

Cause:

The positive range limit switch is detected.

Remedy:

1. Reset the error.
2. Turn the power supply on again.
3. Move the axis into the permissible travel region.

Note: The drive will not accept command values which lead out of the permissible travel range. Entering these command values in the drive controller will result in this error.

See also the functional description: "Travel zone end switch monitoring"

F643 - Attributes

H1 Display :		F6/43
Diag. mess.:	**DE**	F643 Fahrbereichsendschalter positiv betätigt
	EN	F643 Positive Travel Limit Switch detected
	FR	F643 Fin de course positive
	ES	F643 Interruptor de fin de desplazamiento positivo activado
	IT	F643 Rilevati Finecorsa positivo
Mess. no.:		F643 (hex)
Error no:		643
Class:		Nr. 1

F644 Negative Travel Limit Switch detected

The negative travel limit switch was encountered. The axis was brought to a standstill with the "Set velocity command value to zero" error response. Bit 2 of parameter **P-0-0090, Travel limit parameter** is set for "Exceeding travel range as error," or exceeding the position limit began a drive control command (such as the drive-controlled homing procedure).

Cause:

The negative travel limit switch was detected.

Remedy:

1. Reset the error.
2. Turn the power supply on again.
3. Move the axis into the permissible travel region.

Note: The drive will not accept command values which lead out of the permissible travel range. Entering these command values in the drive controller will result in this error.

See also the functional description: "Travel zone end switch monitoring"

F644 - Attributes

H1 Display : F6/44

Diag. mess.:
DE F644 Fahrbereichsendschalter negativ betätigt
EN F644 Negative Travel Limit Switch detected
FR F644 Fin de course négative
ES F644 Interruptor de fin de desplazamiento negativo activado
IT F644 Rilevati Fine Corsa negativo

Mess. no.: F644 (hex)

Error no: 644

Class: Travel range

F820 Bleeder overload

Cause:

The energy of a braking motor cannot be converted quickly enough by the bleeder resistors.

The energy converted by the internal bleeder is analyzed. When the maximum energy capacity of the bleeder is exceeded, it is shut off. The bleeder overload error is generated.

Remedy:

The braking slope should have a flatter parameter, or the bleeder capacity can be increased by adding an additional bleeder.
The drive can be used again after the bleeder has cooled down.

F820 - Attributes

H1 Display : F8/20

Diag. mess.:
DE F820 Bleeder-Überlast
EN F820 Bleeder overload
FR F820 Surcharge bleeder
ES F820 Sobrecarga bleeder
IT F820 Sovracarico Bleeder

Mess. no.: F820 (hex)

Error no: 820

Class: Fatal

F822 Motor Encoder Failure: Signal too small

The analog signals of an external measurement system are used for high resolution analysis of that measurement system. These are monitored according to two criteria:

1. The pointer length, which is calculated from the sine and cosine signals, must equal at least.> 1 V.
2. The maximum pointer length resulting from the sine and cosine ignals must not exceed 11.8 V.

$$\text{pointer length} = \sqrt{\sin^2 + \cos^2}$$

Fig. 1-9: Pointer length

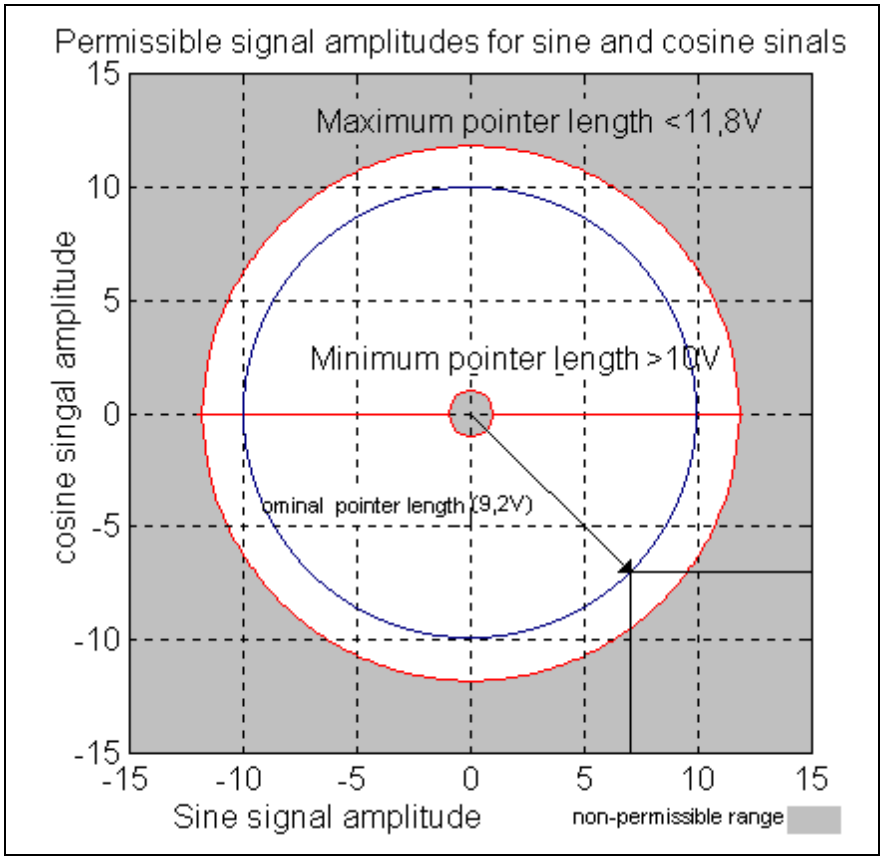

Fig. 1-10: Correct signal amplitude

Example:

Ucos = -6,5V

Usin = 6,5V

$$\text{pointer length} = \sqrt{(-\ 6{,}5\text{V})^2 + 6{,}5\text{V}^2} \ » \ 9{,}2\text{V}$$

Note: The error cannot be cleared in communications phase 4. Before clearing the error, switch to communications phase 2.

Remedy:

- Check the measurement system cable.
- Lay the feedback cable well away from the motor power cable. The cover must be placed over the drive controller (see drive controller project specifications.)
- Check the measurement system and exchange, if necessary.

F822 - Attributes

H1 Display : F8/22

Diag. mess.:
DE F822 Motorgeberfehler: Signalamplitude fehlerhaft
EN F822 Motor Encoder Failure: Signal too small
FR F822 Erreur codeur moteur: signal trop faible
ES F822 Error de encoder de motor: señal demasiado pequeña
IT F822 Errore Encoder Motore: Ampiezza troppo bassa

Mess. no.: F822 (hex)

Error no: 822

Class: Fatal

F827 Drive interlock while drive activated

Cause:

The drive interlock was activated while controller enable was set. The drive controller switches to torque-free state immediately.

Remedy:

The drive interlock should not be activated when controller enable is set. Check the control system of the drive interlock input.

See also the functional description: "Drive Interlock Open"

F827 - Attributes

H1 Display : F8/27

Diag. mess.:
DE F827 Anlaufsperre bei gesetzter Reglerfreigabe
EN F827 Drive interlock while drive activated
FR F827 Démarrage bloqué pendant RF = 1
ES F827 Bloqueo de marcha cuando el accionamiento está activado
IT F827 Drive asservito durante Abilatazione

Mess. no.: F827 (hex)

Error no: 827

Class: Fatal

F860 Overcurrent: Short in power stage

The current in the power transistor bridge has exceeded the twofold value of the device peak current. The drive is immediately set to no torque. An optional blocking brake is applied immediately.

Cause:

1. Short-circuit in the motor cable.
2. Power stage of the drive controller is defective.
3. Parameter values of the current regulator do not comply.

Remedy:

Ref. 1. Check the motor cable for short-circuit
Ref. 2. Replace the drive controller.
Ref. 3. The current regulator parameters and the initial values from the feedback should not differ.

F860 - Attributes

H1 Display :		F8/60
Diag. mess.:	**DE**	F860 Brückensicherung
	EN	F860 Overcurrent: Short in power stage
	FR	F860 Courant excessif: Court circuit à l'étage puissance
	ES	F860 Seguro en puente
	IT	F860 Sovracorr.: Corto Circuito nello Stadio di Potenza
Mess. no.:		F860 (hex)
Error no:		860
Class:		Fatal

F861 Overcurrent: Short to ground

The phase current sum is monitored. Sum = 0 in normal mode. The ground-fault fuse responds if the current sum exceeds 0.5 x I_N.

Cause:

1. Defective motor cable.
2. Ground fault in the motor.

Remedy:

Check motor cable and motor for ground fault; replace if necessary.

F861 - Attributes

H1 Display :		F8/61
Diag. mess.:	**DE**	F861 Erdschluss-Sicherung
	EN	F861 Overcurrent: Short to ground
	FR	F861 Courant excessif: Court circuit à terre
	ES	F861 Seguro de conexión a tierra
	IT	F861 Sovracorr.: Corto Circuito verso Terra
Mess. no.:		F861 (hex)
Error no:		861
Class:		Fatal

F869 +/-15Volt DC Error

The drive controller found a malfunction in the ± 15 V power supply.

Cause:

1. Defective control voltage bus cable.
2. Defective supply module.

Remedy:

For 1. Check the control voltage bus cable or plug connection and exchange if necessary.

For 2. Check supply module (see supply moduleinstructions for use).

F869 - Attributes

H1 Display :		F8/69
Diag. mess.:	**DE**	F869 +/- 15Volt-Fehler
	EN	F869 +/-15Volt DC Error
	FR	F869 Erreur +/-15V
	ES	F869 +/-15Volt Error
	IT	F869 Guasto +/-15Volt
Mess. no.:		F869 (hex)
Error no:		869
Class:		Fatal

F870 +24Volt DC Error

The drive controller requires a 24-V control voltage. The drive's torque is released immediately when the maximum permissible tolerance of +20% is exceeded. An optional blocking brake is applied.

Causes:

1. Defective cable for the control voltages.
2. 24-V power supply overload.
3. Defective power supply unit.
4. Short-circuit in the emergency stop circuit.

Remedy:

Ref. 1. Check and, if necessary, replace the cable and connections of the control voltages.

Ref. 2. Check the 24-V power at the power supply unit.

Ref. 3. Check the power supply unit.

Ref. 4. Check the emergency stop circuit for a short-circuit.

F870 - Attributes

H1 Display : F8/70

Diag. mess.: **DE** F870 +24Volt-Fehler
EN F870 +24Volt DC Error
FR F870 Erreur +24V
ES F870 +24Volt Error
IT F870 Guasto +24Volt

Mess. no.: F870 (hex)

Error no: 870

Class: Fatal

F871 +10Volt DC Error

The power supply voltage for the current sensors has been disrupted.

Cause:

A defect in the drive controller.

Remedy:

Exchange the drive controller.

F871 - Attributes

H1 Display : F8/71

Diag. mess.: **DE** F871 +10Volt-Fehler
EN F871 +10Volt DC Error
FR F871 Erreur +10V
ES F871 +10Volt Error
IT F871 Guasto +10Volt

Mess. no.: F871 (hex)

Error no: 871

Class: Fatal

F878 Velocity Loop Error

If the difference between velocity command value and feedback value is greater than 10% of the maximum motor velocity while the velocity control loop is active, then the feedback velocity value must move in the direction of the command value. This error is generated if the feedback value does not come closer to the command value within 20 ms and the effective torque/force command value is at the limit (=**P-0-4046, Active peak current**).

Cause:

1. Motor cable is connected incorrectly.
2. Defective power section of the drive.
3. Defective feedback.
4. Parameters set incorrectly for velocity controller.
5. Parameters for acceleration or brake slope are too steep.
6. Effective peak current is too low.

Remedy:

For 1. Check motor cable connection.

For 2. Exchange the drive controller.

For 3. Exchange the motor.

For 4. Check the velocity controller according to the user instructions (see the velocity controller chapter).

For 5. Decrease the maximum acceleration in the control system or **decrease P-0-1201, Ramp 1 pitch**.

See also the functional description: "Determining the velocity controller setting"

F878 - Attributes

H1 Display :		F8/78
Diag. mess.:	**DE**	F878 Fehler im Drehzahlregelkreis
	EN	F878 Velocity Loop Error
	FR	F878 Erreur dans la boucle de vitesse
	ES	F878 Error en el círculo de regulación de velocidad
	IT	F878 Errore nell'Anello di Velocità
Mess. no.:		F878 (hex)
Error no:		878
Class:		Fatal

F879 Velocity limit S-0-0091 exceeded

In torque control, the actual velocity is monitored. This error is generated if the programmed velocity in the **S-0-0091, Bipolar velocity limit value** parameter is exceeded by the 1.125-fold value and/or a minimum of 100 rpm (rotary motor) or 100 mm/min (linear motor).

Cause:

The torque command value was for too long a time greater than the load torque. This causes the actual speed to be increased up to the maximum possible motor speed.

Remedy:

Assign the correct torque command value to the required task. Reduce the **S-0-0092, Bipolar torque/force limit value** parameter value.

See also the functional description "Limiting to bipolar velocity limit value"

F879 - Attributes

H1 Display : F8/79

Diag. mess.:
DE F879 Geschwindigkeits-Grenzwert S-0-0091 überschritten
EN F879 Velocity limit S-0-0091 exceeded
FR F879 Limite de vitesse S-0-0091 dépassée
ES F879 Valor límite de velocidad S-0-0091 excedido
IT F879 Valore di Massimo di Velocità S-0-0091 superato

Mess. no.: F879 (hex)
Error no: 879
Class: Fatal

F889 Regeneration overcurrent

Cause:

The feedback current of the drive is greater than 1.2 times the type current (with HDD only).

Remedy:

Replace the drive.

F889 - Attributes

H1 Display : F8/89

Diag. mess.:
DE F889 Rückspeise-Überstrom
EN F889 Regeneration overcurrent
FR F889 Courant excessif dans la rétroalimentation
ES F889 Sobrecorriente de retroalimentación
IT F889 Sovracorrente rigenerata

Mess. no.: F889 (hex)
Error no: 889
Class: Fatal

F890 Processor fault power supply unit

Cause:

The RSK processor on the plug-in storage card is not working.

Remedy:

Exchange drive controller or the plug-in storage card.

F890 - Attributes

H1 Display : F8/90

Diag. mess.:
DE F890 Prozessorfehler Versorgungsmodul
EN F890 Processor fault power supply unit
FR F890 Erreur de processeur dans module d'alimentation
ES F890 Watchdog de electrónica de retroalimentación
IT F890 Allarme Rigenerazione Elettronica

Mess. no.: F890 (hex)
Error no: 890
Class: Fatal

F891 Power stage fault

The DC bus voltage is not established after the main contactor has been switched on.

Cause:

If there is a short-circuit in the DC bus, voltage cannot build up after the drive has been switched on. This error is generated if the voltage remains under 100 V for approx. 200ms.

Remedy:

Exchange the drive controller.

F891 - Attributes

H1 Display :		F8/91
Diag. mess.:	**DE**	F891 Leistungsteil defekt
	EN	F891 Power stage fault
	FR	F891 Erreur dans le stage de puissance
	ES	F891 Fallo del suministro de potencia
	IT	F891 Guasto nello Stadio di Potenza
Mess. no.:		F891 (hex)
Error no:		891
Class:		Fatal

F892 Wrong code of current measuring unit

A faulty current measuring unit was discovered after the control voltage was turned on.

Cause:

The current measuring unit has an incorrect code. The coding does not work with the RSK circuit board.

Remedy:

Exchange the current measuring unit.

F892 - Attributes

H1 Display :		F8/92
Diag. mess.:	**DE**	F892 Falsche Codierung der Strommesskarte
	EN	F892 Wrong code of current measuring unit
	FR	F892 Code de la mesure de courant faux
	ES	F892 Codificación incorrecta de tarjeta de medición de corri
	IT	F892 Codice per Unità di Misura Corrente falso
Mess. no.:		F892 (hex)
Error no:		892
Class:		Fatal

F893 No regenerating current to mains

This error message is generated if the feedback current command value is at its maximum and no current is flowing for approx. 50ms.

Cause:

1. Power supply not properly connected.
2. Defective feedback.

Remedy:

For 1. Check the power supply connection according to the project planning specifications.

For 2. Exchange the drive controller.

F893 - Attributes

H1 Display :		F8/93
Diag. mess.:	**DE**	F893 Kein Netzrückspeisestrom
	EN	F893 No regenerating current to mains
	FR	F893 Pas de courant régénératif
	ES	F893 No hay corriente de retroalimentación
	IT	F893 Nessuna Corrente rigenerata alla Linea
Mess. no.:		F893 (hex)
Error no:		893
Class:		Fatal

F894 Checksum error

Cause:

The checksum is stored in the EPROM during the initial programming. Each time the drive is turned on, the processor checks to see if the checksum which was created from the processor corresponds to the one which has been stored. This error is generated if this is not the case.

Remedy:

Exchange the RSK circuit board EPROM.

F894 - Attributes

H1 Display :		F8/94
Diag. mess.:	**DE**	F894 Prüfsummenfehler
	EN	F894 Checksum error
	FR	F894 Checksum faux
	ES	F894 Error de suma de comprobación
	IT	F894 Errore Checksum
Mess. no.:		F894 (hex)
Error no:		894
Class:		Fatal

1.3 Warning diagnostic messages

E201 No mains connected

Cause:

After the control voltage has been switched on, the drive checks to see if the mains connection of the power supply has also been switched on. This warning is given if this has not happened correctly.

Remedy:

Check power connections (external relay, fuse, etc.).

E201 - Attributes

H1 Display :		E2/01
Diag. mess.:	**DE**	E201 Netzanschluss Leistungsteil fehlt
	EN	E201 No mains connected
	FR	E201 Alimentation puissance non branchée
	ES	E201 No hay conexión de red
	IT	E201 Alimentazione di Potenza manca
Mess. no.:		E201 (hex)
Class:		Not fatal

E202 Not ready for power on

Cause:

As usually happens, the main contactor K1 was turned off when the controller enable was not set. Because of the drive controller capacities, the DC bus voltage must not decrease suddenly after the main contactor is turned off. This message is generated as long as the DC bus voltage > 250V and prevents the main contactor from being turned on. This serves to protect discharging resistors.

Remedy:

The warning is automatically recalled by the drive controller when the DC bus voltage falls below 250V.

E202 - Attributes

H1 Display :		E2/02
Diag. mess.:	**DE**	E202 Nicht bereit zur Leistungszuschaltung
	EN	E202 Not ready for power on
	FR	E202 Entraînement pas prêt pour mise sous puissance
	ES	E202 No está listo para conectar potencia
	IT	E202 Non Pronto per Inserzione Potenza
Mess. no.:		E202 (hex)
Class:		Not fatal

E219 Warning Drive temp. surveillance defective

Temperature monitoring checks to see if the measured drive controller temperature is within reasonable bounds. If it determines that it is lower than -10°C, then it is assumed the measuring unit is defective. Warning **E219 Warning Drive temp. surveillance defective** will appear for 30 seconds. Afterwards the drive will be brought to a standstill according to the selected error response and message **F220 Bleeder overload shutdown** will be generated.

Cause:

1. Sensor not connected to the DRP3 circuit board.
2. Broken cable in the drive controller, or defective sensor.

Remedy:

Exchange or repair the drive controller.

E219 - Attributes

H1 Display :		E2/19
Diag. mess.:	**DE**	E219 Warnung Verstärker-Temp.überwachung defekt
	EN	E219 Warning Drive temp. surveillance defective
	FR	E219 Alerte erreur dans la surveillance température ampli
	ES	E219 Aviso control de temperatura de amplificador defectuos
	IT	E219 Preallarme Difetto nel Sovratemp. Azionamento
Mess. no.:		E219 (hex)
Class:		Not fatal

E221 Warning Motor temp. surveillance defective

Temperature monitoring checks to see if the measured motor temperature is within reasonable bounds. If it determines that it is lower than -10°C, then it is assumed the measuring unit is defective. Warning **E221 Warning Motor temp. surveillance defective** will appear for 30 seconds. Afterwards the drive controller will be brought to a standstill according to the selected error response and message **F221 Error Motor temp. surveillance defective** will be generated.

Cause:

1. Motor temperature sensor not connected.
2. Broken cable.
3. Defective sensor.
4. Broken cable in drive controller.

Remedy:

For 1. Connect the sensor to the drive controller and to the motor (see project planning specifications for the motor).

For 2. Exchange the wiring between the drive controller and the motor.

For 3. Exchange the motor.

For 4. Exchange the drive controller.

See also the functional description: "Temperature monitoring"

E221 - Attributes

H1 Display : E2/21

Diag. mess.:
DE E221 Warnung Motor-Temp.überwachung defekt
EN E221 Warning Motor temp. surveillance defective
FR E221 Alerte erreur dans la surveillance température moteur
ES E221 Aviso control de temperatura de motor defectuos
IT E221 Preallarme Difetto nel Sovratemp. Motore

Mess. no.: E221 (hex)

Class: Not fatal

E225 Motor Overload

The maximum possible motor current is reduced in order to protect the motor from being destroyed.

If a current flows in the that is greater than 2.2 times the motor current at standstill S-0-0111, the maximum possible motor current (motor peak current S-0-0109) is reduced. With 4-fold motor current at standstill, the reduction starts after 400 ms. With 5-fold current it starts earlier, and with 3-fold current later.

The **E225 Motor overload**E225 Motor overload" warning is issued when the motor peak current is reduced by the limitation.

The reduction also has an effect on the active permanent current P-0-4045.

See also the functional description: "Monitoring of the thermal motor load"

E225 - Attributes

H1 Display : E2/25

Diag. mess.:
DE E225 Motor-Überlast
EN E225 Motor Overload
FR E225 Surcharge Moteur
ES E225 Sobrecarga de motor
IT E225 Sovracarico Motore

Mess. no.: E225 (hex)

Class: Not fatal

E226 Undervoltage in power section

If bit 5 of the **P-0-0118, Power off on error** parameter has been set, an undervoltage condition will be handled as a nonfatal warning. The drive issues this warning if the drive enabling signal is present and the DC bus voltage message disappears.

Cause:

Power supply unit is switched off or mains failure occurs while the drive enabling signal is set.

Remedy:

Switch off the drive enabling signal before you switch off the power supply unit.

E226 - Attributes

H1 Display : E2/26

Diag. mess.:
DE E226 Unterspannung im Leistungsteil
EN E226 Undervoltage in power section
FR E226 Sous-tension puissance
ES E226 Tensión baja en parte de potencia
IT E226 Errore Alimentazione bassa nello Stadio di Potenza

Mess. no.: E226 (hex)

Class: Nicht fatal

E247 Interpolation velocity = 0

The drive-internal position command value interpolator is active if

- the "drive-internal interpolation" mode,
- the "relative drive-internal interpolation" mode,
- drive-controlled homing
- drive halt

are active.

The E247 warning is issued if the employed velocity specification is 0. Possible velocity specifications are:

- **S-0-0259, Positioning velocity**
- **S-0-0041, Homing velocity**
- **S-0-0091, Bipolar velocity limit value**

See also the functional description: "Generator Function: Drive Internal Interpolation"

E247 - Attributes

H1 Display : E2/47

Diag. mess.:
DE E247 Interpolationsgeschwindigkeit = 0
EN E247 Interpolation velocity = 0
FR E247 Vitesse d'interpolation = 0
ES E247 Velocidad de interpolación = 0
IT E247 Velocità per Interpolazione = 0

Mess. no.: E247 (hex)

E248 Interpolation acceleration = 0

The drive-internal position command value interpolator is active if

- the "drive-internal interpolation" mode,
- the "relative drive-internal interpolation" mode,
- drive-controlled homing
- drive halt

are active.

The E248 warning is issued if the employed acceleration specification is 0. Possible acceleration specifications are:

- **S-0-0260**, **Positioning acceleration**
- **S-0-0042, Homing acceleration**
- **S-0-0138, Bipolar acceleration limit value**

See also the functional description: "Generator Function: Drive Internal Interpolation"

E248 - Attributes

H1 Display :		E2/48
Diag. mess.:	**DE**	E248 Interpolationsbeschleunigung = 0
	EN	E248 Interpolation acceleration = 0
	FR	E248 Accélération d'interpolation = 0
	ES	E248 Aceleración de interpolaciòn = 0
	IT	E248 Accelerazione per Interpolazione = 0
Mess. no.:		E248 (hex)

E249 Positioning velocity S-0-0259 > S-0-0091

Cause:

A velocity that is used for approaching a target position is specified in the **S-0-0259, Positioning velocity** parameter for the "drive-internal interpolation" and "relative drive-internal interpolation" modes.

Message E249 is generated if this velocity is greater than the permissible maximum value **S-0-0091, Bipolar velocity limit value**. At the same time, bit 5 of **S-0-0012, Class 2 diagnostics** is set.

Remedy:

Reduce the value of **S-0-0259, Positioning velocity**.

See also the functional description "Drive-internal interpolation".

E249 - Attributes

H1 Display : E2/49

Diag. mess.:
DE E249 Positioniergeschw. S-0-0259 > S-0-0091
EN E249 Positioning velocity S-0-0259 > S-0-0091
FR E249 Vitesse de positionnement S-0-0259 > S-0-0091
ES E249 Velocidad de posicionamiento S-0-0259 > S-0-0091
IT E249 Velocità Posiz. S-0-0259 > S-0-0091

Mess. no.: E249 (hex)

Class: Not fatal

E250 Drive Overtemp. prewarning

The temperature of the heatsink in the drive controller has reached the maximum permissible temperature. The drive controller follows the command value input for a period of 30 seconds. This makes it possible to bring the axis to a standstill with the control system while keeping true to the process (for example, close the operation, leave the collision area, etc.).

After 30 seconds, the response set in parameter **P-0-0119, Best possible deceleration** will be performed by the drive controller.

Cause:

1. Failure of the drive's internal blower.
2. Failure of the control cabinet's climate control.
3. Incorrect control cabinet dimensioning in regards to heat dissipation.

Remedy:

For 1. If the blower fails, exchange the drive controller.

For 2. Install climatization feature in the cabinet.

For 3. Check the dimensions of the control cabinet.

E250 - Attributes

H1 Display : E2/50

Diag. mess.:
DE E250 Verstärker Übertemp.-Vorwarnung
EN E250 Drive Overtemp. prewarning
FR E250 Préalerte surchauffe ampli
ES E250 Aviso exceso de temperatura de accionamiento
IT E250 Preallarme Sovratemp. Azionam.

Mess. no.: E250 (hex)

Class: Not fatal

E251 Motor Overtemp. prewarning

The motor is too hot. The motor temperature, which is displayed in parameter **S-0-0383, Motor temperature**, has exceeded the value in **S-0-0201, Motor warning temperature**. Warning E251 is generated. If the temperature increases above the value in **S-0-0204, Motor shutdown temperature**, error **F219 Motor overtemp. shutdown** will be generated.

The values for parameters **S-0-0201, Motor warning temperature** and **S-0-0204, Motor shutdown temperature** are set at 140°C and 150°C for MKD and MDD motors respectively.

Set MDD, MKD and MKE motors to 145°C or 155°C.

Cause:

The motor became overloaded. The effective torque required of the motor was above the permissible continuous standstill torque for too long.

Remedy:

Check the layout of the motor. For systems which have been in use for a long time, check to see if the drive controller conditions have changed (in regards to pollution, friction, components which have been moved, etc.).

See also the functional description: "Temperature monitoring"

E251 - Attributes

H1 Display :		E2/51
Diag. mess.:	**DE**	E251 Motor Übertemp.-Vorwarnung
	EN	E251 Motor Overtemp. prewarning
	FR	E251 Préalerte surchauffe moteur
	ES	E251 Aviso exceso de temperatura de motor
	IT	E251 Preallarme Sovratemp. Motore
Mess. no.:		E251 (hex)
Class:		Not fatal

E253 Target position out of travel zone

Cause:

In "Drive-controlled interpolation" operating mode, a check is performed to see whether the specified **S-0-0258, Target position**, is within the possible travel region of the drive.

This is defined by parameters **S-0-0049, Positive position limit value** and **S-0-0050, Negative position limit value**.

Message E253 is generated if the target position lies outside of the travel range. Additionally, warning bit 13 is set in **S-0-0012, Class 2 diagnostic**.

Remedy:

Check the specified **S-0-0258, Target position** and correct it, if necessary.

See also the functional description: "Drive Internal Interpolation"

E253 - Attributes

H1 Display : E2/53

Diag. mess.:
DE E253 Zielposition außerhalb des Verfahrbereichs
EN E253 Target position out of travel zone
FR E253 Position à atteindre hors limites
ES E253 Posición objeto fuera del campo de desplazamiento
IT E253 Posizione inpostata fuori dai Limiti

Mess. no.: E253 (hex)

Class: Not fatal

E255 Feedrate-Override S-0-0108 = 0

The travel velocity used in drive-controlled travel commands can be changed with parameter **S-0-0108, Feedrate override**.
This warning is given if the value of this parameter is 0, since the drive cannot then follow command values.

Cause:

1. The control system's feed potentiometer is set to zero or is being evaluated incorrectly.
2. The parameter was set to an incorrect value.

Remedy:

For 1. Check the feed potentiometer.

For 2. Set the parameter to the correct value for the application.

See also the functional description: "Sequence control Drive-Controlled Homing"

E255 - Attributes

H1 Display : E2/55

Diag. mess.:
DE E255 Feedrate-Override S-0-0108 = 0
EN E255 Feedrate-Override S-0-0108 = 0
FR E255 Atténuation d'avance S-0-0108 = 0
ES E255 Override de alimentación S-0-0108 = 0
IT E255 Riduzione Velocità Avanz. S-0-0108 = 0

Mess. no.: E255 (hex)

Class: Not fatal

E257 Continuous current limit active

The thermal controller load is monitored. If a rated current profile is demanded of the drive controller which would require too high a power transistor load over time (too much warming of the power output stage), the drive controller will react by dynamically reducing the effective peak current. This warning will be given at the same time. Parameter **P-0-4046, Active peak current** is reduced. Before the peak current is actually limited, the advance warning message **E261 Continuous current limitation prewarning** should have been generated.

Cause:

The drive controller was overloaded.

Remedy:

1. Check the drive layout.
2. Reduce acceleration.

   With systems which have been used for longer periods of time, check to see if drive controller conditions have changed in regards to:

   - Friction
   - Components which have been moved.

See also the functional description: "Monitoring the thermal load"

E257 - Attributes

H1 Display :		E2/57
Diag. mess.:	**DE**	E257 Dauerstrombegrenzung aktiv
	EN	E257 Continuous current limit active
	FR	E257 Courant permanent limité
	ES	E257 Límite de corriente continua activo
	IT	E257 Limitazione Corr. continuativa attiva
Mess. no.:		E257 (hex)
Class:		Not fatal

E259 Command velocity limit active

In the position control and velocity control operating modes, the effective velocity command value is limited to the value in parameter **S-0-0091, Bipolar velocity limit value**. The warning is given if the resulting velocity command value reaches this limit.

Cause:

Parameter **S-0-0091, Bipolar velocity limit value** was set too low.

Remedy:

In normal operating conditions, set parameter **S-0-0091, Bipolar velocity limit value** to a value 10% greater than the NC effective velocity.

See also the functional description: "Limiting to bipolar velocity limit value"

E259 - Attributes

H1 Display : E2/59

Diag. mess.:
DE E259 Geschwindigkeitssollwertbegrenzung aktiv
EN E259 Command velocity limit active
FR E259 Vitesse de consigne limitée
ES E259 Límite de valor nominal de velocidad activo
IT E259 Limitazione Velocità comandata attiva

Mess. no.: E259 (hex)

Class: Not fatal

E261 Continuous current limiting prewarning

Digital drives are monitored by a continually operating temperature model. If the thermal load reaches 100%, the continuous current limit will be activated shortly thereafter.
Before the torque is reduced, a continuous current limit early warning is given via a switching threshold, which is determined by parameter **P-0-0127, Overload warning**.
To deactivate the warning, enter **P-0-0127** = 100% into the parameter.

Cause:

The drive controller was overloaded.

Remedy:

1. Check the drive layout.
2. Reduce acceleration.
3. Increase the switching threshold in parameter **P-0-0127, Overload warning**
4. With systems which have been used for longer periods of time, check to see if drive controller conditions have changed in regards to:
   - Friction
   - Components which have been moved
   - Feed during processing.

See also the functional description: "Monitoring the thermal load"

E261 - Attributes

H1 Display : E2/61

Diag. mess.:
DE E261 Dauerstrombegrenzung Vorwarnung
EN E261 Continuous current limiting prewarning
FR E261 Préalerte limite de courant perm.
ES E261 Preaviso límite corriente continua
IT E261 Preallarme Limitazione Corrente contin.

Mess. no.: E261 (hex)

Class: Not fatal

E263 Velocity Command Value > Limit S-0-0091

Cause:

The value given to the drive for **S-0-0036, Velocity command value** was greater than permissible.

Remedy:

It is limited to **S-0-0091, Bipolar velocity limit value**.

See also the functional description: "Velocity control"

E263 - Attributes

H1 Display :		E2/63
Diag. mess.:	**DE**	E263 Geschwindigkeitssollwert > Grenzwert S-0-0091
	EN	E263 Velocity Command Value > Limit S-0-0091
	FR	E263 Vitesse consigne > limite S-0-0091
	ES	E263 Velocidad nominal mayor que S-0-0091
	IT	E263 Velocità comandata > S-0-0091
Mess. no.:		E263 (hex)
Class:		Not fatal

E410 Slave not scanned or adress 0

While the SERCOS ring is being initialized in communications phase 1, each slave which is to participate in the additional phase uptake must be addressed by the SERCOS master. Slaves which are not addressed or which have been set to drive address "0" indicate this by generating warning E410. Communication with these slaves in higher communications phases is not possible. They work only in the repeater mode.

Cause:

The slave was not scanned in phase 1, or "0" address is set.

Remedy:

- Set the correct slave address.
- Check the SERCOS master configuration.

See also the functional description: "Adjustments of the SERCOS Interface"

E410 - Attributes

H1 Display :		E4/10
Diag. mess.:	**DE**	E410 Slave nicht gescannt oder Adresse 0
	EN	E410 Slave not scanned or adress 0
	FR	E410 Esclave non reconnu ou adresse 0
	ES	E410 Esclavo no scaneado o dirección 0
	IT	E410 Drive non trovato o Indirizzo 0
Mess. no.:		E410 (hex)

E825 Overvoltage in power stage

The DC bus voltage has reached impermissibly high values. (Ud > 475 V). The drive controller was switched to torque-free operation so as not to endanger the drive's power amplifier.

Cause:

The energy regenerated by a braking drive controller (a main-spindle drive, for example) cannot be converted by the bleeder resistors quickly enough.

Remedy:

The braking slope should have a flatter parameter, or the bleeder capacity can be increased by adding an additional bleeder.

E825 - Attributes

H1 Display :		E8/25
Diag. mess.:	**DE**	E825 Überspannung im Leistungsteil
	EN	E825 Overvoltage in power stage
	FR	E825 Tension excessive à l'étage puissance
	ES	E825 Sobretensión en la parte de potencia
	IT	E825 Sovratensione nello Stadio di Potenza
Mess. no.:		E825 (hex)
Class:		Fatal

E826 Undervoltage in power section

If bit 3 of the **P-0-0118, Power off on error** parameter has been set, an undervoltage condition will be handled as a "fatal warning", and the motor-driven operation will be shut down. The drive issues this warning if the drive enabling signal is present and the DC bus voltage message disappears.

Cause:

Power supply unit is switched off or mains failure occurs while the drive enabling signal is set.

Remedy:

Switch off the drive enabling signal before you switch off the power supply unit.

E826 - Attributes

H1 Display :		E8/26
Diag. mess.:	**DE**	E826 Unterspannung im Leistungsteil
	EN	E826 Undervoltage in power section
	FR	E826 Sous-tension puissance
	ES	E826 Tensión baja en potencia
	IT	E826 Errore Alimentazione Bassa
Mess. no.:		E826 (hex)
Class:		Fatal

E829 Positive Position Limit exceeded

The drive received a command value which resulted in an axis position outside the positive travel range. The axis was brought to a standstill by setting the velocity command value to zero. A class 1 diagnostic error is not generated. The drive will automatically follow command values which lead into the allowable range after they are entered. "Handle travel range exceeded as warning" is set in bit 2 of parameter **P-0-0090, Command value transmit time (TMTSG)**.

Cause:

S-0-0049, Positive position limit value exceeded.

Remedy:

Enter command values which lead back into the allowable range.

Note: Only such command values will be accepted which lead back into the allowed working range. With other command values, the drive will stop again. - The parameter **S-0-0057, Position window** defines a hysteresis for the travel limits.

See also the functional description: "Axis limit values"

E829 - Attributes

H1 Display :		E8/29
Diag. mess.:	**DE**	E829 Lagegrenzwert positiv überschritten
	EN	E829 Positive Position Limit exceeded
	FR	E829 Limite de position positive dépassée
	ES	E829 Valor límite de posición positiva excedido
	IT	E829 Limite di Posizione positiva superato
Mess. no.:		E829 (hex)
Class:		Fatal

E830 Negative Position Limit exceeded

The drive received a command value which resulted in an axis position outside the negative travel range. The axis was brought to a standstill by setting the velocity command value to zero. A class 1 diagnostic error is not generated. The drive will automatically follow command values which lead into the allowable range after they are entered. "Handle travel range exceeded as warning" is set in bit 2 of parameter **P-0-0090, Travel limit parameter**.

Cause:

S-0-0050, Negative travel limit value exceeded.

Remedy:

Enter command values which lead back into the allowable range.

Note: Only such command values will be accepted which lead back into the allowed working range. With other command values, the drive will stop again. - The parameter **S-0-0057, Position window** defines a hysteresis for the travel limits.

See also the functional description: "Axis limit values"

E830 - Attributes

H1 Display : E8/30

Diag. mess.:
DE E830 Lagegrenzwert negativ überschritten
EN E830 Negative Position Limit exceeded
FR E830 Limite de position négative dépassée
ES E830 Valor límite de posición negativa excedido
IT E830 Limite di Posizione negativa superato

Mess. no.: E830 (hex)

Class: Fatal

E834 Emergency-Stop

The emergency stop switch was pressed, thus causing the drive to perform the emergency stop function that has been selected via the **P-0-0119, Best possible deceleration** parameter. There is no error message issued to the controller.

Cause:

The emergency stop switch was pressed.

Remedy:

Eliminate the malfunction that led to the activation of the emergency stop switch. The warning will then extinguish.

See also the functional description: "Emergency stop feature"

E834 - Attributes

H1 Display : E8/34

Diag. mess.:
DE E834 E-Stop aktiviert
EN E834 Emergency-Stop
FR E834 Arrêt d´urgence
ES E834 Parada de emergencia activada
IT E834 Stop per Emergenza

Mess. no.: E834 (hex)

E843 Positive Limit Switch activated

The drive has been provided with a command value that leads to an axis position outside the positive travel range. The axis is topped by setting the velocity command value to zero. A status class 1 error is not generated. The drive automatically follows command values that lead back into the valid range. Bit 2 of **P-0-0090, Travel limit parameter** is set to "**Overtravelling is handled as a warning**".

Cause:

Positive limit switch has been actuated.

Remedy:

Specify command values that lead back to the valid range.

See also the functional description: "Travel Zone Limit Switch Monitoring"

E843 - Attributes

H1 Display : E8/43

Diag. mess.:
DE E843 Fahrbereichsendschalter positiv betätigt
EN E843 Positive Limit Switch activated
FR E843 Fin de course positive
ES E843 Interruptor de fin de desplazamiento positivo activado
IT E843 Finecorsa positivo attivato

Mess. no.: E843 (hex)

Class: Fatal

E844 Negative Limit Switch activated

The drive has been provided with a command value that leads to an axis position outside the negative travel range. The axis is topped by setting the velocity command value to zero. A status class 1 error is not generated. The drive automatically follows command values that lead back into the valid range. Bit 2 of **P-0-0090, Travel limit parameter** is set to "**Overtravelling is handled as a warning**".

Cause:

Negative limit switch has been actuated.

Remedy:

Specify command values that lead back to the valid range.

See also the functional description: "Travel Zone Limit Switch Monitoring"

E844 - Attributes

H1 Display : E8/44

Diag. mess.:
DE E844 Fahrbereichsendschalter negativ betätigt
EN E844 Negative Limit Switch activated
FR E844 Fin de course négative
ES E844 Interruptor de fin de desplazamiento negativo activado
IT E844 Finecorsa negativo attivato

Mess. no.: E844 (hex)

Class: Fatal

Notes

1.4 Command diagnostic messages

C100 Communication phase 3 transition check

Meaning:

The command **S-0-0127, C1 Communication phase 3 transition check** has been activated.

See also the functional description: "S-0-0127, C1 Communication Phase 3 Transition Check".

C100 - Attributes

H1 Display :		C1
Diag. mess.:	**DE**	C100 Umschaltvorbereitung Phase 2 nach 3
	EN	C100 Communication phase 3 transition check
	FR	C100 Préparation commutation phase 2 vers 3
	ES	C100 Comprobación conmutación fase 2 a 3
	IT	C100 Fase di Comunicazione 3 test di Transizione
Mess. no.:		C100 (hex)

C101 Invalid Communication Parameter (S-0-0021)

Cause:

Communications parameters which are needed to operate the drive in communication phase 3 are invalid.

Remedy:

A list of the invalid parameters can be seen in parameter **S-0-0021, List of invalid op. data for comm. ph. 2**.
The invalid parameters must be rewritten so they are correct.

See also the functional description: "S-0-0127, C1 Communication Phase 3 Transition Check".

C101 - Attributes

H1 Display :		C1/01
Diag. mess.:	**DE**	C101 Kommunikations-Parameter unvollständig (S-0-0021)
	EN	C101 Invalid Communication Parameter (S-0-0021)
	FR	C101 Paramètres de communication invalides (S-0-0021)
	ES	C101 Parámetro de comunicación incompleto (S-0-0021)
	IT	C101 Parametro di Comunicazione invalido (S-0-0021)
Mess. no.:		C101 (hex)
Class:		Command

C104 config. IDN for MDT not configurable

Cause:

Telegram type 7 was set in parameter **S-0-0015, Telegram type parameter**. Parameters which are missing in **S-0-0188, List of configurable data in MDT** are kept in **S-0-0024**, **Configuration list for the master data telegram**.

Remedy:

You must either set a priority telegram (Telegram type = 0..6) or else provide **S-0-0024, Config. list of the master data telegram** with parameters. These parameters are also contained in **S-0-0188, List of configurable data in the MDT**.

See also the functional description: "Configuration of telegram contents"

C104 - Attributes

H1 Display :		C1/04
Diag. mess.:	**DE**	C104 konfig. Identnummern für MDT nicht konfigurierbar
	EN	C104 config. IDN for MDT not configurable
	FR	C104 config. IDN pour MDT non configurable
	ES	C104 Nº ident. de configuración para MDT no configurable
	IT	C104 IDN per MDT non configurabile
Mess. no.:		C104 (hex)
Class:		Command

C105 Configurated length > max. length for MDT

Cause:

Telegram type 7 was set in parameter **S-0-0015, Telegram type parameter**. The length of the configured record in MDT, which is determined by **S-0-0024, Configurations list of the master data telegram**, exceeds the maximum permissible length **S-0-0186, Length of the configurable data record in the MDT.**

Remedy:

You must either set a priority telegram in **S-0-0015, Telegram type parameter** (telegram type = 0..6) or else reduce the number of configurable parameters in MDT.

See also the functional description: "Configuration of telegram contents"

C105 - Attributes

H1 Display :		C1/05
Diag. mess.:	**DE**	C105 Maximallänge für MDT überschritten
	EN	C105 Configurated length > max. length for MDT
	FR	C105 Longueur configurée > longueur. max. du MDT
	ES	C105 Superada la longitud máx. para MDT
	IT	C105 Lung. configurata > Lung. mass. per MDT
Mess. no.:		C105 (hex)
Class:		Command

C106 config. IDN for AT not configurable

Cause:

Telegram type 7 was set in parameter **S-0-0015, Telegram type parameter**. Parameters which are not contained in **S-0-0187, List of configurable data in AT** can be seen in **S-0-0016, Custom amplifier telegram configuration list**.

Remedy:

You must either set a priority telegram in parameter **S-0-0015, Telegram type parameter** (telegram type = 0..6) or you must provide **S-0-0016, Custom amplifier telegram configuration list** with parameters that are contained in **S-0-0187, List of configurable data in the AT.**

See also the functional description: "Configuration of telegram contents"

C106 - Attributes

H1 Display :		C1/06
Diag. mess.:	**DE**	C106 konfig. Identnummern für AT nicht konfigurierbar
	EN	C106 config. IDN for AT not configurable
	FR	C106 config. IDN pour AT non configurable
	ES	C106 Nº ident. de config. para AT no configurable
	IT	C106 IDN per AT non configurabile
Mess. no.:		C106 (hex)
Class:		Command

C107 Configurated Length > Max.Length for AT

Cause:

Message frame type 7 has been selected in **S-0-0015, Telegram Type Parameter**. The length of the configured data record in the AT, that is defined via **S-0-0016, Custom amplifier telegram configuration list**, exceeds the maximum permissible **S-0-0185, Length of the configurable data record in the AT**.

Remedy:

Either select the priority message frame via **S-0-0015, Telegram Type Parameter** (message frame type = 0...6) or reduce the number of configured parameters in the AT (**S-0-0016**).

See also the functional description: "Configuration of telegram contents"

C107 - Attributes

H1 Display :		C1/07
Diag. mess.:	**DE**	C107 Maximallänge für AT überschritten
	EN	C107 Configurated Length > Max.Length for AT
	FR	C107 long. configurée > long. max de l' AT
	ES	C107 Superada la longitud máxima para AT
	IT	C107 Lung. config. > Lung. mass. per AT
Mess. no.:		C107 (hex)
Class:		Command

C108 Time Slot Parameter > Sercos Cycle Time

Cause:

One of the time slot parameters:

- **S-0-0006, AT transmission starting time (T1)**
- **S-0-0089, MDT transmission starting time (T2)**
- **S-0-0007, Feedback acquisition starting time (T4)**
- **S-0-0008, Command valid time (T3)**

exceeds **S-0-0002, SERCOS Cycle time (Tscyc).**

Remedy:

Correct the appropriate parameter(s). These times are determined by the manufacturer of the control system and are specified by the SERCOS interface.

See also the functional description: "Configuration of the telegram send and receive times"

C108 - Attributes

H1 Display :		C1/08
Diag. mess.:	**DE**	C108 Zeitschlitzparameter > Sercos-Zykluszeit
	EN	C108 Time Slot Parameter > Sercos Cycle Time
	FR	C108 Time Slot Parameter > Sercos Cycle Time
	ES	C108 Parámetro de ranura temporal > Tiempo ciclo Sercos
	IT	C108 Parametro Slot Time > Tempo Ciclo Sercos
Mess. no.:		C108 (hex)
Class:		Command

C109 Position of Data Record in MDT (S-0-0009) even

Cause:

Parameter **S-0-0009, Beginning address in master data telegram** contains an even value. This is not permitted.

Remedy:

Parameter **S-0-0009, Beginning address in master data telegram** must be set to an odd value. These parameters are determined by the manufacturer of the control system, and are specified by the SERCOS interface.

See also the functional description: "Configuration of the telegram send and receive times"

C109 - Attributes

H1 Display :		C1/09
Diag. mess.:	**DE**	C109 Anfangsadresse MDT (S-0-0009) gerade
	EN	C109 Position of Data Record in MDT (S-0-0009) even
	FR	C109 Adresse début du MDT (S-0-0009) paire
	ES	C109 Dirección inicial MDT (S-0-0009) plano
	IT	C109 Posizione del Data Record in MDT S-0-0009 pari
Mess. no.:		C109 (hex)
Class:		Command

C110 Length of MDT (S-0-0010) odd

Cause:

Parameter **S-0-0010, Length of master data telegram** contains an odd value. This is not permitted.

Remedy:

Parameter **S-0-0010, Length of master data telegram** must be set to an even value. These parameters are determined by the manufacturer of the control system, and are specified by the SERCOS interface.

See also the functional description: "Configuration of the telegram send and receive times"

C110 - Attributes

H1 Display :		C1/10
Diag. mess.:	**DE**	C110 Länge MDT (S-0-0010) ungerade
	EN	C110 Length of MDT (S-0-0010) odd
	FR	C110 Longueur du MDT (S-0-0010) impaire
	ES	C110 Longitud MDT (S-0-0010) irregular
	IT	C110 Lunghezza di MDT (S-0-0010) dispari
Mess. no.:		C110 (hex)
Class:		Command

C111 ID9 + Record Length - 1 > Length MDT (S-0-0010)

Cause:

Parameter(s) are set incorrectly for **S-0-0009, Beginning address in master data telegram** and **S-0-0010, Length of master data telegram**. The length of the record in MDT for the drive plus the starting address in MDT is greater than the total length of the MDT.

Remedy:

The parameters for **S-0-0009, Beginning address in master data telegram** and **S-0-0010, Length of master data telegram** must be corrected. Those parameters are determined by the manufacturer of the control system and are specified by the SERCOS interface.

See also the functional description: "Configuration of the telegram send and receive times"

C111 - Attributes

H1 Display :		C1/11
Diag. mess.:	**DE**	C111 ID9 + Datensatzlänge - 1 > Länge MDT (S-0-0010)
	EN	C111 ID9 + Record Length - 1 > Length MDT (S-0-0010)
	FR	C111 ID9 + long. bloc données - 1 > Long. MDT (S-0-0010)
	ES	C111 ID9 + Longitud bloque datos - 1 > Long. MDT (S-0-0010)
	IT	C111 ID9 + Lung. Record - 1 > Lung. MDT (S-0-0010)
Mess. no.:		C111 (hex)
Class:		Command

C112 TNcyc (S-0-0001) or TScyc (S-0-0002) Error

Cause:

Only 500 us or even multiples of 1ms are permitted as valid values for **S-0-0001, NC Cycle time (TNcyc)** and **S-0-0002, SERCOS Cycle time (Tscyc)**. Here, this is not the case.

Remedy:

S-0-0001, NC Cycle time (TNcyc) and **S-0-0002, SERCOS Cycle time (Tscyc)** must be corrected. These parameters are determined by the manufacturer of the control system, and are specified by the SERCOS interface.

See also the functional description: "Configuration of the telegram send and receive times"

C112 - Attributes

H1 Display :		C1/12
Diag. mess.:	**DE**	C112 TNcyc (S-0-0001) oder TScyc (S-0-0002) fehlerhaft
	EN	C112 TNcyc (S-0-0001) or TScyc (S-0-0002) Error
	FR	C112 Erreur TNcyc (S-0-0001) ou TScyc (S-0-0002)
	ES	C112 Error en TNcyc (S-0-0001) o TScyc (S-0-0002)
	IT	C112 Errore in TNCyc S-0-0001 o in TSync S-0-0002
Mess. no.:		C112 (hex)
Class:		Command

C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) Error

Cause:

The value of **S-0-0001, NC Cycle time (TNcyc)** can only be equal to or be a multiple of **S-0-0002, SERCOS Cycle time (Tscyc)**. Here this is not the case.

Remedy:

S-0-0001, NC Cycle time (Tncyc) and **S-0-0002, SERCOS Cycle time (Tscyc)** must be corrected. These parameters are determined by the manufacturer of the control system and are specified by the SERCOS interface.

See also the functional description: "Configuration of the telegram send and receive times"

C113 - Attributes

H1 Display :		C1/13
Diag. mess.:	**DE**	C113 Verhält. TNcyc (S-0-0001) zu TScyc (S-0-0002) Fehler
	EN	C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) Error
	FR	C113 Erreur relation TNcyc (S-0-0001) p/r TScyc (S-0-0002)
	ES	C113 Error en relación TNcyc (S-0-0001) a TScyc (S-0-0002)
	IT	C113 Errore Rel. tra TNCyc S-0-0001 e TScyc S-0-0002
Mess. no.:		C113 (hex)
Class:		Command

C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)

Cause:

The maximum permissible value for **S-0-0007, Feedback acquisition starting time (T4)** is:

S-0-0002, SERCOS Cycle time (Tscyc) -
S-0-0005, Minimum feedback acquisition time(T4min).

The value for **S-0-0007, Feedback acquisition starting time (T4)** is incorrect.

Remedy:

****Correct S-0-0007, Feedback acquisition starting time (T4)**. These parameters are determined by the manufacturer of the control system, and are specified by the SERCOS interface.

See also the functional description: "Configuration of the telegram send and receive times"

C114 - Attributes

H1 Display :		C1/14
Diag. mess.:	**DE**	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
	EN	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
	FR	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
	ES	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
	IT	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
Mess. no.:		C114 (hex)
Class:		Command

C115 T2 too small

Cause:

The value set for **S-0-0089, MDT Transmit starting time (T2)** is incorrect. The drive cannot work with this value.

Remedy:

****Correct S-0-0089, MDT Transmit starting time (T2)**.

These parameters are determined by the manufacturer of the control system, and are specified by the SERCOS interface.

See also the functional description: "Configuration of the telegram send and receive times"

C115 - Attributes

H1 Display :		C1/15
Diag. mess.:	**DE**	C115 T2 zu klein
	EN	C115 T2 too small
	FR	C115 T2 trop petit
	ES	C115 T2 demasiado pequeño
	IT	C115 T2 troppo piccolo
Mess. no.:		C115 (hex)
Class:		Command

C200 Communication phase 4 transition check

Meaning:

The command **S-0-0128, C200 Communication phase 4 transition check** has been activated.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C200 - Attributes

H1 Display : C2

Diag. mess.:
DE C200 Umschaltvorbereitung Phase 3 nach 4
EN C200 Communication phase 4 transition check
FR C200 Préparation commutation phase 3 vers 4
ES C200 Comprobación comunicación fase 3 a 4
IT C200 Fase di Comunicazione 4 Test di Transizione

Mess. no.: C200 (hex)

C201 Invalid Parameter(s) (->S-0-0022)

Cause:

Parameters which will be necessary to operate the drive in communications phase 4 are invalid. The invalid parameters can be seen in **S-0-0022, IDN list of invalid op. data for comm. ph. 3**.

Remedy:

The parameters of **S-0-0022, IDN list of invalid op. data for comm. ph. 3** must be rewritten so they are correct.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C201 - Attributes

H1 Display : C2/01

Diag. mess.:
DE C201 Parametersatz unvollständig (->S-0-0022)
EN C201 Invalid Parameter(s) (->S-0-0022)
FR C201 Paramètre(s) invalide(s) (->S-0-0022)
ES C201 Bloque de parámetro inválido (->S-0-0022)
IT C201 Parametro invalido (->S-0-0022)

Mess. no.: C201 (hex)

Class: Command

C202 Parameter Limit Error (->S-0-0022)

Cause:

Parameters which are necessary to operate the drive in communications phase 4 are either outside of their minimum or maximum input values or the entered value can't be processed (for BIT bars). The incorrect parameters are listed in **S-0-0022, IDN list of invalid op. data for comm. ph. 3**.

Remedy:

The parameters of **S-0-0022, IDN list of invalid op. data for comm. ph. 3** must be rewritten so they are correct.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C202 - Attributes

H1 Display : C2/02

Diag. mess.:
DE C202 Parameter Grenzwertfehler (->S-0-0022)
EN C202 Parameter Limit Error (->S-0-0022)
FR C202 Erreur valeur limite paramètres (->S-0-0022)
ES C202 Error límite en parámetro (->S-0-0022)
IT C202 Errore Limite Parametro (->S-0-0022)

Mess. no.: C202 (hex)

Class: Command

C203 Parameter Calculation Error (->S-0-0022)

Cause:

Parameters that are required for phase-4 operation (operating mode) cannot be processed in that way. The incorrect parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**.

Remedy:

Write correct values to the parameters in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C203 - Attributes

H1 Display : C2/03

Diag. mess.:
DE C203 Parameter Umrechnungsfehler (->S-0-0022)
EN C203 Parameter Calculation Error (->S-0-0022)
FR C203 Erreur de calcul de paramètre (->S-0-0022)
ES C203 Error de cálculo en parámetro (->S-0-0022)
IT C203 Errore di Calcolo nel Parametro (->S-0-0022)

Mess. no.: C203 (hex)

Class: Command

C204 Motor type P-0-4014 incorrect

An MDD-, MKD or MKE motor (value 1 or 5) is entered into parameter **P-0-4014, Motor type**. The appropriate abbreviation "MDD", "MKD", or MKE however, was not found in parameter **S-0-0141, Motor type** in the motor feedback data memory.

Cause:

1. Incorrect parameter set for type of motor.
2. The motor feedback memory cannot be read.

Remedy:

For 1. Enter the type of motor used in parameter **P-0-4014, Motor type**

For 2. Check feedback connection.
If feedback is defective, exchange motor.

See also the functional description: "Automatic setting of the motor type for motors with feedback memory"

C204 - Attributes

H1 Display :		C2/04
Diag. mess.:	**DE**	C204 Motorart P-0-4014 fehlerhaft
	EN	C204 Motor type P-0-4014 incorrect
	FR	C204 Type de moteur P-0-4014 faux
	ES	C204 Tipo de motor P-0-4014 incorrecto
	IT	C204 Tipo di Motore P-0-4014 falso
Mess. no.:		C204 (hex)
Class:		Command

C210 External Feedback required (->S-0-0022)

Cause:

Values that require an external encoder have been entered in **S-0-0147, Homing parameter** or in the **S-0-0032...35, Mode of Operation** parameters. However, zero (not available) has been entered in the **P-0-0075, Interface Feedback 2, external** parameter.

The ident number of the parameter that requires the external encoder is entered in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**.

Remedy:

Modify **S-0-0147, Homing parameter** or the **S-0-0032...35, Mode of Operation** parameters to utilization of the motor encoder instead of external encoder.

Set **P-0-0075, Interface Feedback 2, external** to a value different than zero to activate the external measuring system.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C210 - Attributes

H1 Display : C2/10

Diag. mess.:
DE C210 Externer Geber erforderlich (->S-0-0022)
EN C210 External Feedback required (->S-0-0022)
FR C210 Feedback externe nécessaire (->S-0-0022)
ES C210 Requerida retroalimentación externa (->S-0-0022)
IT C210 Richiesto Feedback esterna (->S-0-0022)

Mess. no.: C210 (hex)

Class: Command

C211 Invalid feedback data (->S-0-0022)

Invalid data has been encountered when the parameters stored in the motor feedback were read, or an error has occurred when the data was read.

Causes:

1. Motor feedback cable not connected or defective
2. Motor feedback defective
3. Drive controller defective

Remedy:

Ref. 1. Check motor feedback cable; connect both sides
Ref. 2. Replace motor
Ref. 3. Replace amplifier

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C211 - Attributes

H1 Display : C2/11

Diag. mess.:
DE C211 Ungültige Feedbackdaten (->S-0-0022)
EN C211 Invalid feedback data (->S-0-0022)
FR C211 Donnée feedback incorrecte (->S-0-0022)
ES C211 Datos de retroalimentación inválidos (->S-0-0022)
IT C211 Dati di Feedback invalidi (->S-0-0022)

Mess. no.: C211 (hex)

Class: Command

C212 Invalid amplifier data (->S-0-0022)

During drive initialization, the operating software fetches data from an EEPROM in the drive controller. This error message is generated after that access has failed.

Causes:

Defective hardware in the drive controller.

Remedy:

Replace drive controller.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C212 - Attributes

H1 Display : C2/12

Diag. mess.:
DE C212 Ungültige Verstärkerdaten (->S-0-0022)
EN C212 Invalid amplifier data (->S-0-0022)
FR C212 Donnée variateur incorrecte (->S-0-0022)
ES C212 Datos de amplificador inválidos (->S-0-0022)
IT C212 Dati Azionamento invalidi (->S-0-0022)

Mess. no.: C212 (hex)

Class: Command

C213 Position data scaling error

Cause:

The scaling parameters for position data permit the position data display format to be selected. The drive-internal position data format depends on the employed motor encoder and the encoder resolution. The factor used for converting the position data from the drive-internal format into the display format or vice versa is outside the processable range, because either

- linear motor and rotary position scaling with motor reference, or
- rotary motor and linear position scaling with motor reference, or
- linear motor with modulo scaling has been selected; or
- the determined factor used for converting the position data from the display format to the internal format, and vice versa, cannot be represented.

Remedy:

Checking and correcting the relevant parameters, such as:

- **S-0-0076, Position data scaling type**
- **S-0-0077, Linear position data scaling factor**
- **S-0-0078, Linear position data scaling exponent**
- **S-0-0079, Rotational position resolution**
- **S-0-0116, Resolution of motor feedback**
- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**
- **S-0-0123, Feed constant**
- **P-0-0074, Interface feedback 1**
- **S-0-0277, Position feedback 1 type parameter**

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C213 - Attributes

H1 Display : C2/13

Diag. mess.: **DE** C213 Wichtung der Lagedaten fehlerhaft
EN C213 Position data scaling error
FR C213 Erreur calibrage données de position
ES C213 Error de escala de datos de posición
IT C213 Errore Taratura Dati Posizione

Mess. no.: C213 (hex)

Class: Command

C214 Velocity data scaling error

Cause:

The scaling parameters for velocity data permit the velocity data display format to be selected. The drive-internal velocity data format depends on the employed motor encoder and the encoder resolution. The factor used for converting the velocity data from the drive-internal format into the display format or vice versa is outside the processable range.

Remedy:

Checking and correcting the relevant parameters, such as:

- **S-0-0044, Velocity data scaling type**
- **S-0-0045, Velocity data scaling factor**
- **S-0-0046, Velocity data scaling exponent**
- **S-0-0116, Resolution of motor feedback**
- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**
- **S-0-0123, Feed constant**
- **P-0-0074, Interface feedback 1**
- **S-0-0277, Position feedback 1 type parameter**

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C214 - Attributes

H1 Display : C2/14

Diag. mess.: **DE** C214 Wichtung der Geschwindigkeitsdaten fehlerhaft
EN C214 Velocity data scaling error
FR C214 Erreur calibrage données de vitesse
ES C214 Error de escala de datos de velocidad
IT C214 Errore Taratura Dati di Velocità

Mess. no.: C214 (hex)

Class: Command

C215 Acceleration data scaling error

Cause:

The display format of the acceleration data can be set for the acceleration data using scaling parameters. The drive-controlled format of the acceleration data is dependent on what motor encoder and encoder resolution are used. The factor for converting acceleration data from internal drive format to display format (or vice-versa) is outside the workable range.

Remedy:

Check and set the relevant parameters correctly as follows:

- **S-0-0160, Acceleration data scaling type**
- **S-0-0161, Acceleration data scaling factor**
- **S-0-0162, Acceleration data scaling exponent**
- **S-0-0116, Resolution of motor feedback**
- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**
- **S-0-0123, Feed constant**
- **P-0-0074, Interface feedback 1**
- **S-0-0277, Position feedback 1 type parameter**

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C215 - Attributes

H1 Display :		C2/15
Diag. mess.:	**DE**	C215 Wichtung der Beschleunigungsdaten fehlerhaft
	EN	C215 Acceleration data scaling error
	FR	C215 Erreur calibrage données d'accélération
	ES	C215 Error de escala de datos de aceleración
	IT	C215 Errore Taratura Dati Accelerazione
Mess. no.:		C215 (hex)
Class:		Command

C216 Torque/force data scaling error

Cause:

The display format of the torque/force data can be set for the torque/force data using scaling parameters. The factor for converting torque data from drive-controlled format to display format (or vice-versa) is outside the workable area.

Remedy:

Check and set the relevant parameters correctly as follows:

- **S-0-0086, Torque/force data scaling type**
- **S-0-0093, Torque/force data scaling factor**
- **S-0-0094, Torque/force data scaling exponent**

- **S-0-0110, Amplifier peak current**
- **S-0-0111, Motor current at standstill**

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C216 - Attributes

H1 Display : C2/16

Diag. mess.:
DE C216 Wichtung der Drehmoment/Kraftdaten fehlerhaft
EN C216 Torque/force data scaling error
FR C216 Erreur calibrage données de couple/force
ES C216 Error de escala de datos de par/fuerza
IT C216 Errore Taratura Dati Coppia/Forza

Mess. no.: C216 (hex)

Class: Command

C217 Motor feedback data reading error

If you have entered these values into **P-0-0074, Interface feedback 1**:

- "1" for standard interface,
- "4" for DFF module, or
- "8" for DAG module (Endat)

then the attached encoder must have a feedback data memory. The values for the encoder resolution and the feedback type are taken from there. An error was discovered while reading these values.

Cause:

1. Defective motor feedback cable.
2. Defective motor feedback.

Remedy:

For 1. Check the motor feedback cable.

For 2. Exchange the motor.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C217 - Attributes

H1 Display : C2/17

Diag. mess.:
DE C217 Fehler beim Lesen der Motorgeberdaten
EN C217 Motor feedback data reading error
FR C217 Erreur lecture données feedback moteur
ES C217 Error en lectura de datos retroalimentación de motor
IT C217 Errore nella Lettura dei Dati di Feedback

Mess. no.: C217 (hex)

Class: Command

C218 External feedback data reading error

If **P-0-0075, Interface feedback 2, external** is set at

- "1" for standard interface,
- "4" for DFF module, or
- "8" for DAG module (Endat)

then the attached encoder must have a feedback data memory. The values for the encoder resolution and the feedback type are taken from there. An error was discovered while reading these values.

Cause:

1. Defective measurement system cable.
2. Defective measurement system.

Remedy:

For 1. Check the measurement system cable.

For 2. Exchange the measurement system.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C218 - Attributes

H1 Display :		C2/18
Diag. mess.:	**DE**	C218 Fehler beim Lesen der Daten des ext. Gebers
	EN	C218 External feedback data reading error
	FR	C218 Erreur lecture données feedback externe
	ES	C218 Error en lectura de datos de retroalimentación externa
	IT	C218 Errore nella Lettura dati Feedback esterno
Mess. no.:		C218 (hex)
Class:		Command

C220 Motor Feedback initializing error

A number of tests are performed when the motor encoder is initialized. An error was detected during this process. This error may be:

- Error while reading the angle rectification data
- Error while copying the angle rectification data
- Interruption of communication with the encoder
- Assembly error with the position of an initialization track
- Error while reading the analog signal of an initialization track
- Error in the pointer length of the analog signal of an initialization track
- Invalid offset between the high and low resolution track
- Error in the measuring system micro-controller

Cause:

1. Defective motor feedback cable.
2. Defective motor feedback.
3. Defective measurement system interface.

Remedy:

For 1. Check the motor feedback cable.

For 2. Exchange the motor.

For 3. Exchange the measuring system interface (module).

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C220 - Attributes

H1 Display :		C2/20
Diag. mess.:	**DE**	C220 Fehler bei Motorgeber-Initialisierung
	EN	C220 Motor Feedback initializing error
	FR	C220 Erreur initialisation feedback moteur
	ES	C220 Error al inicializar retroalim. de motor
	IT	C220 Errore nell' Inizializz. del Feedback Motore
Mess. no.:		C220 (hex)
Class:		Command

C221 Ext. Feedback initializing error

Several checks are performed during the initialization of an external encoder. An error was detected during this process. This error may be:

- Error while reading the angle rectification data
- Error while copying the angle rectification data

Interruption of communication with the encoder

- Assembly error with the position of an initialization track
- Error while reading the analog signal of an initialization track
- Error in the pointer length of the analog signal of an initialization track
- Invalid offset between the high and low resolution track
- Error in the measuring system micro-controller
- External 24V set for SSI interface with DAG 1.2

Cause:

1. External encoder cable defect.
2. Defective feedback.
3. Defective measurement system interface.

Remedy:

For 1. Check the external feedback cable.

For 2. Exchange feedback.

For 3. Exchange the measuring system interface (module).

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C221 - Attributes

H1 Display : C2/21

Diag. mess.:
DE C221 Fehler bei Ext.Geber-Initialisierung
EN C221 Ext. Feedback initializing error
FR C221 Erreur initialisation feedback externe
ES C221 Error al inicializar retroalim. externa
IT C221 Errore nell' Inizializz. del Feedback esterno

Mess. no.: C221 (hex)

Class: Command

C223 Input value for max. range too high

Cause:

An internal position resolution has been selected via the **S-0-0278, Maximum travel range** parameter that no longer guarantees a correct commutation of the motor.

Remedy:

Select a smaller value for the **S-0-0278, Maximum travel range** parameter.

C223 - Attributes

H1 Display : C2/23

Diag. mess.:
DE C223 Eingabewert max. Verfahrbereich zu groß
EN C223 Input value for max. range too high
FR C223 Entrée excessive pour champs de course
ES C223 Valor de entrada máx. campo desplazamiento excesivo
IT C223 Valore troppo alta per Campo mass.

Mess. no.: C223 (hex)

Class: Command

C225 Coprocessor not ready for initialization

The drive controller has a coprocessor. This coprocessor is initialized during the transfer command. The coprocessor signals that it is ready for initialization. If it is not ready, this error is generated.

Cause:

Coprocessor failed.

Remedy:

Exchange the drive controller.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C225 - Attributes

H1 Display : C2/25

Diag. mess.:
DE C225 Coprozessor nicht bereit zur Initialisierung
EN C225 Coprocessor not ready for initialization
FR C225 Coprocesseur pas prêt pour initialisation
ES C225 Coprocesador no listo para inicialización
IT C225 Coprocessore non pronto per Inizializzazione

Mess. no.: C225 (hex)

Class: Command

C226 Coprocessor acknowledge failed

The drive controller has a coprocessor. This coprocessor is initialized during the transfer command. If the coprocessor does not confirm the initialization by the master processor, this error will be generated.

Cause:

The coprocessor failed.

Remedy:

Exchange the drive controller.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C226 - Attributes

H1 Display : C2/26

Diag. mess.:
DE C226 Kein Acknowledge von Coprozessor
EN C226 Coprocessor acknowledge failed
FR C226 Erreur acquittement coprocesseur
ES C226 No hay confirmación de coprocesador
IT C226 Riconosc. Coprocessore fallita

Mess. no.: C226 (hex)

Class: Command

C227 Modulo range error

Causes:

The selected modulo value is greater than half the position representation range of the drive.

Remedy:

Decrease the modulo value.

See also the functional description: "Modulo processing-limiting conditions"

C227 - Attributes

H1 Display : C2/27

Diag. mess.:
DE C227 Modulo-Bereichs-Fehler
EN C227 Modulo range error
FR C227 Erreur plage module
ES C227 Error de campo de módulo
IT C227 Errore nel Range del Modulo

Mess. no.: C227 (hex)

Class: Command

C228 Controller type S-0-0140 wrong

Several internal software settings are made based on parameter **S-0-0140, Controller type**. If the content of this parameter cannot be used, then this error will be generated.

Cause:

1. The controller type cannot be processed by this software.
2. Amplifier EEProm defective.

Remedy:

For 1. Contact Indramat.

For 2. Exchange/repair the control device.

See also the functional description "S-0-0128, C2 communication phase 4 transition check".

C228 - Attributes

H1 Display : C2/28

Diag. mess.:
DE C228 Regelgerätetyp S-0-0140 falsch
EN C228 Controller type S-0-0140 wrong
FR C228 Type de variateur S-0-0140 faux
ES C228 Tipo regulador S-0-0140 incorrecto
IT C228 Tipo di Azionamento S-0-0140 falso

Mess. no.: C228 (hex)

Class: Command

C232 Motor encoder interface not present

Cause:

The encoder interface that was selected in the **P-0-0074, Interface feedback 1** parameter has not been installed or cannot be found by the drive (due to a defect).

Remedy:

Install or replace the selected encoder interface.

See also the functional description: "S-0-0127, C1 Communication Phase 3 Transition Check"

C232 - Attributes

H1 Display : C2/32

Diag. mess.:
DE C232 Motorgeberinterface nicht vorhanden
EN C232 Motor encoder interface not present
FR C232 Interface du codeur moteur manque
ES C232 Interface de encoder de motor no existe
IT C232 Manca l'Interfaccia del Encoder Motore

Mess. no.: C232 (hex)

Class: Command

C233 External encoder interface not present

Cause:

The encoder interface that has been selected in the **P-0-0075, Interface Feedback 2, external** parameter has not been installed, or is defective and can therefore not be recognized by the drive.

Remedy:

Install or replace the selected encoder interface.

See also the functional description: "S-0-0127, C1 Communication Phase 3 Transition Check"

C233 - Attributes

H1 Display : C2/33

Diag. mess.:
DE C233 Externes Geberinterface nicht vorhanden
EN C233 External encoder interface not present
FR C233 Interface du codeur externe manque
ES C233 Interface de encoder externo no existe
IT C233 Manca l'Interfaccia del Encoder esterno

Mess. no.: C233 (hex)

Class: Command

C234 Encoder combination not possible

Cause:

The encoder interface that has been selected in the **P-0-0075, Interface Feedback 2, external** parameter cannot be supported by the drive; it has already been allocated to the motor encoder.

Remedy:

Select another external encoder.

See also the functional description: "Determining the encoder interface of the external encoder"

C234 - Attributes

H1 Display : C2/34

Diag. mess.:
DE C234 Geberkombination nicht möglich
EN C234 Encoder combination not possible
FR C234 Combinaison des capteurs impossible
ES C234 Combinación de transmisor imposible
IT C234 Combinazione Encoder non possibile

Mess. no.: C234 (hex)

Class: Command

C235 Load-side motor encoder with inductance motor only

Cause:

The functionality of the external encoder can be defined in the **P-0-0185, Function of ext. encoder** parameter. If 'load-side motor encoder' has been selected as the function of the external encoder, that function will only be supported for asynchronous motors.

Remedy:

Set the **P-0-4014, Motor type** parameter according to the employed motor type.

Check the **P-0-0185, Function of ext. encoder** parameter.

See also the functional description: "S-0-0127, C1 Communication Phase 3 Transition Check"

C235 - Attributes

H1 Display : C2/35

Diag. mess.:
DE C235 Lastseitiger Motorgeber nur bei Asynchronmotor
EN C235 Load-side motor encoder with inductance motor only
FR C235 Capteur moteur coté charge seulement pour moteur async.
ES C235 Encoder de motor lado de carga sólo con motor asíncrono
IT C235 Encoder Lato Carica solo con Motore asincrono

Mess. no.: C235 (hex)

Class: Command

C236 Motor feedback required (P-0-0074)

Cause:

A motor encoder is not required (P-0-0074 = 0) if a load-sided motor encoder has been selected via the **P-0-0185, Function of ext. encoder** parameter. However, **S-0-0147, Homing parameter** or the **S-0-0032...35, Mode of Operation** parameters contain values that require a motor encoder.

Remedy:

Change **S-0-0147, Homing parameter** or the **S-0-0032...35, Mode of Operation** parameters such that they are suitable for using an external encoder.

Enter a value ≠ 0 in the **P-0-0074, Interface feedback 1** parameter to activate the motor encoder.

See also the functional description: "S-0-0127, C1 Communication Phase 3 Transition Check"

C236 - Attributes

H1 Display :		C2/36
Diag. mess.:	**DE**	C236 Motorgeber erforderlich (P-0-0074)
	EN	C236 Motor feedback required (P-0-0074)
	FR	C236 Feedback moteur nécessaire (P-0-0074)
	ES	C236 Requerida retroalimentación motor (P-0-0074)
	IT	C236 Richiesto Feedback Motore (P-0-0074)
Mess. no.:		C236 (hex)
Class:		Command

C300 Set absolute measuring

Command **P-0-0012, C300 Command 'Set absolute measurement'** was activated by the control system in use.

See also the functional description: "Set absolute measuring"

C300 - Attributes

H1 Display :		C3
Diag. mess.:	**DE**	C300 Absolutmaß setzen
	EN	C300 Set absolute measuring
	FR	C300 Calage origine absolue
	ES	C300 Ajustar medición absoluta
	IT	C300 Set Misura Assoluta
Mess. no.:		C300 (hex)

C302 Absolute Measuring system not installed

Command **P-0-0012, C300 Command 'Set absolute measurement'** was started without an absolute measuring system being present.

The command cannot be processed because no absolute measuring system is available.

Cause:

1. The command should not have been activated.
2. The contacted motor or the external measurement system was not executed as an absolute encoder.

Remedy:

For 1. Stop execution of the command.

For 2. Equip the motor or external measurement system with an absolute encoder function.

See also the functional description: "Possible error messages when setting the absolute dimension"

C302 - Attributes

H1 Display : C3/02

Diag. mess.:
DE C302 Kein absolutes Meßsystem vorhanden
EN C302 Absolute Measuring system not installed
FR C302 Système de mesure absolue non disponible
ES C302 No existe sistema de medición absoluta
IT C302 Sistema di Misura assoluta non installato

Mess. no.: C302 (hex)

Class: Command

C400 Command: Switch to parameter mode

Description:

The command for transition is in parameter mode. While editing the parameters that can be edited only in parameter mode, this command must be processed.

C400 - Attributes

H1 Display : C4

Diag. mess.:
DE C400 Umschalten auf Phase 2
EN C400 Command: Switch to parameter mode
FR C400 Passage en phase 2
ES C400 Conmutación a fase 2
IT C400 Comando: commutazione in Modo Parametri

Mess. no.: C400 (hex)

C401 Drive active, Switching not allowed

Cause:

The command **C400 Command: Switch to parameter mode** would be started without the control enable being activated.

Remedy:

End the command and turn off the drive enable, then the command can be started from the beginning.

C401 - Attributes

H1 Display : C4/01

Diag. mess.:
DE C401 Antrieb aktiv, Umschalten nicht zulässig
EN C401 Drive active, Switching not allowed
FR C401 Entraînement validé, passage impossible
ES C401 Accionamiento activo, conmutación no permitida
IT C401 Azionamento abilitato, Commut. non consentita

Mess. no.: C401 (hex)

Class: Command

C402 Only allowed without Master

Cause:

The command **P-0-4023, C400 Communication phase 2 transition** was started via the serial interface. The command is not executed and terminated with this error message because the active SERCOS interface is of a higher priority and was disturbed.

The command can only be executed if the SERCOS interface is inactive (i.e. there are no signals applied to the receiver of the SERCOS interface).

Remedy:

Perform phase selection via SERCOS interface or de-activate SERCOS interface before the command is started.

C402 - Attributes

H1 Display : C4/02

Diag. mess.:
DE C402 Nur ohne Master zulässig
EN C402 Only allowed without Master
FR C402 Autorisé seulement sans maître
ES C402 Sólo permitido sin master
IT C402 Permesso solo senza Master

Mess. no.: C402 (hex)

Class: Command

C500 Reset class 1 diagnostic, error reset

The command for clearing errors, **S-0-0099, C500 Reset class 1 diagnostic** was activated by the control system in use.

See also the functional description: "Clearing errors"

C500 - Attributes

H1 Display : C5

Diag. mess.:
DE C500 Reset Zustandsklasse 1, Fehler rücksetzen
EN C500 Reset class 1 diagnostic, error reset
FR C500 RAZ classe d'état 1
ES C500 Reset diagnóstico clase 1, reset de error
IT C500 Cancellazione Errori Classe 1

Mess. no.: C500 (hex)

C501 Error delet only in Parameter Mode

Cause:

An attempt has been made of clearing the error **F822 Motor encoder failure: signal too small** in communication phase 4 (operating mode). This is only possible in communication phases < 4 (parameter setting mode).

Remedy:

1. Switch back the communication phase.
2. Activate the command again.

C501 - Attributes

H1 Display :		C5/01
Diag. mess.:	**DE**	C501 Fehler nur im Parametriermodus 1 löschbar
	EN	C501 Error delet only in Parameter Mode
	FR	C501 Effacement erreur seulement en mode paramètre
	ES	C501 Borrar error solamente en modo de parámetro
	IT	C501 Cancell. permessa solo In Modo Parametri
Mess. no.:		C501 (hex)
Class:		Command

C600 Drive controlled homing procedure command

Command **S-0-0148, C600 Drive controlled homing procedure command** was activated by the control system in use.

See also the functional description: "Drive-controlled homing"

C600 - Attributes

H1 Display :		C6
Diag. mess.:	**DE**	C600 Kommando Antriebsgeführtes Referenzieren
	EN	C600 Drive controlled homing procedure command
	FR	C600 Commande d'origine sous contrôle entraînement
	ES	C600 Comando referenciado controlado por accionamiento
	IT	C600 Procedura di Azzeramento Asse
Mess. no.:		C600 (hex)

C601 Homing only possible with Drive Enable

Cause:

The controller enabling signal was not active when the program was started. This is not permitted.

Remedy:

1. Switch on the controller enable signal.
2. Start the command again.

See also the functional description: "Possible Error Messages During Drive-Controlled Homing"

C601 - Attributes

H1 Display : C6/01

Diag. mess.:
DE C601 Referenzieren nur mit Reglerfreigabe möglich
EN C601 Homing only possible with Drive Enable
FR C601 Prise d'origine seulement avec entraînement validé
ES C601 Referenciado no posible sin desbloque de accionamiento
IT C601 Azzeramento solo possibile con Azion. Abilit.

Mess. no.: C601 (hex)

Class: Command

C602 Distance homing switch-reference mark erroneous

Cause:

The evaluation of the homing switch has been activated. The distance between the positive homing switch edge and the reference mark that shall be interpreted is outside the valid range.

Remedy:

Read the value from the **S-0-0298, Reference cam shift by..** parameter and enter it in the **S-0-0299, Home switch offset** parameter.

See also the functional description: "Connection and Configuration of the Home switch"

C602 - Attributes

H1 Display : C6/02

Diag. mess.:
DE C602 Abstand Nullschalter-Referenzmarke fehlerhaft
EN C602 Distance homing switch-reference mark erroneous
FR C602 Erreur distance came origine top 0
ES C602 Error Distancia marca refer. de interr. puesta a cero
IT C602 Distanza errata tra camma di zero e Imp. Encod.

Mess. no.: C602 (hex)

Class: Command

C604 Homing of absolut encoder not possible

Command **S-0-0148, C600 Drive controlled homing procedure command** was activated. An absolute measuring system was selected using the encoder selection in **S-0-0147, Homing parameter**. This command can only run if command **P-0-0012, C300 Command 'Set absolute measurement'** has been previously activated.

Remedy:

First activate command **P-0-0012, C300 Command 'Set absolute measurement'**, and then start command **S-0-0148, C600 Drive controlled homing procedure command**. This procedure will define the absolute reference point.

See also the functional description: "Possible Error Messages During Drive-Controlled Homing"

C604 - Attributes

H1 Display : C6/04

Diag. mess.:
DE C604 Referenzieren mit Absolutmaßgeber nicht möglich
EN C604 Homing of absolut encoder not possible
FR C604 Prise d'origine avec codeur absolu impossible
ES C604 Referenciado de encoder absoluto no posible
IT C604 Azzer. dell' Encoder Assoluto non permesso

Mess. no.: C604 (hex)

Class: Command

C700 Basic load

With motors of the MDD, MKD and MKE series, the controller parameters for the connected motor that are stored in the controller are set to their default values by activating the controller parameters that are stored in the motor feedback. The drive controller issues the C7 message to indicate that the **C700 Basic load** command has been activated via the command parameter **S-0-0262, C700 Command basic load**.

Cause:

The command **C700 Basic load** has been activated.

See also the functional description "Load default"

C700 - Attributes

H1 Display : C7

Diag. mess.:
DE C700 Urladen
EN C700 Basic load
FR C700 Chargement initial
ES C700 Carga básica
IT C700 Caricamento iniziale

Mess. no.: C700 (hex)

C701 Basic load not possible if drive is enabled

Cause:

Command **S-0-0262, C700 Command basic load** cannot be run if the controller enable is set.

Remedy:

1. Disable controller enable.
2. Start the command again.

See also the functional description: "Error Conditions of the Load Default Settings Procedure"

C701 - Attributes

H1 Display : C7/01

Diag. mess.:
DE C701 Urladen bei Reglerfreigabe nicht möglich
EN C701 Basic load not possible if drive is enabled
FR C701 Chargement initial impossible avec RF actif
ES C701 Carga básica no posible si ajustado en bloqueo regulad
IT C701 Caricamento iniziale non poss. se Azion. abilitato

Mess. no.: C701 (hex)

Class: Command

C702 Default parameters not available

With motors of the MDD, MKD and MKE series, adapting the control loops to the connected digital drive is done by activating the speed controller parameters that are stored in the motor feedback. The drive controller employs the C702 message to signal that the **S-0-0262, C700 Command basic load** command has been activated, but that there is no data memory at the connected motor.

Remedy:

Order the parameter sheet of the employed motor from INDRAMAT Service, and enter the parameters.

See also the functional description: "Error Conditions of the Load Default Settings Procedure"

C702 - Attributes

H1 Display : C7/02

Diag. mess.:
DE C702 Keine Defaultparameter vorhanden
EN C702 Default parameters not available
FR C702 Paramètres par défaut non disponibles
ES C702 Parámetros por defecto no disponibles
IT C702 Parametri Standard non disponibili

Mess. no.: C702 (hex)

Class: Command

C703 Default parameters invalid

Cause:

The default parameters are read from the motor feedback data memory. At least one of these parameters is invalid.

Remedy:

Check the connection to the motor feedback. Exchange motor if necessary.

See also the functional description: "Error Conditions of the Load Default Settings Procedure"

C703 - Attributes

H1 Display : C7/03

Diag. mess.:
DE C703 Default-Parameter ungültig
EN C703 Default parameters invalid
FR C703 Paramètres par défaut invalides
ES C703 Parámetro por defecto no válido
IT C703 Parametri Standard non validi

Mess. no.: C703 (hex)

Class: Command

C704 Parameters not copyable

Cause:

The default parameters in use are not compatible with this software version.

Remedy:

Contact Indramat.

See also the functional description: "Error Conditions of the Load Default Settings Procedure"

C704 - Attributes

H1 Display : C7/04

Diag. mess.:
DE C704 Parameter nicht kopierbar
EN C704 Parameters not copyable
FR C704 Les paramètres ne peuvent pas être copiés.
ES C704 Parametros no se pueden copiar.
IT C704 Parametri non copiabili

Mess. no.: C704 (hex)

Class: Command

C705 Locked with password

The parameter **S-0-0267, Password** offers the possibility to set a write protection for the drive parameters. The diagnostic message **C705 Locked with Password** indicates, that the command **C700 Basic Load** has been started, although the drive parameters are protected with the customer password.

See also the functional description: "Error Conditions of the Load Default Settings Procedure"

C705 - Attributes

H1 Display : C7/05

Diag. mess.:
DE C705 Verriegelt mit Passwort
EN C705 Locked with password
FR C705 Bloqué avec mot de passe
ES C705 Bloqueado con contraseña
IT C705 Bloccato con parola chiave

Mess. no.: C705 (hex)

Class: Command

C800 Default Parameter load

Default values of all parameters in the **S-0-0192, IDN-list of backup operation data** are stored in the drive. Those values define a basic state of the drive that permits the drives to be switched "operational". Mechanical components and control loop settings are not taken into consideration. Starting the **C800 Default parameter load** command loads the default values into the related parameters and sets them valid.

Cause:

The **C800 Default parameter load** command has been activated.

See also the functional description: "Basic parameter block"

C800 - Attributes

H1 Display : C8

Diag. mess.:
DE C800 Default-Parameter laden
EN C800 Default Parameter load
FR C800 Chargement des paramètres par défaut
ES C800 Cargar parámetros por defecto
IT C800 Caricamento Parametri di Default

Mess. no.: C800 (hex)

C801 Parameter default value erroneous (-> S-0-0021)

Cause:

During the execution of **P-0-4094, C800 Command Base-parameter load,** a default value that has been stored in the drive was recognized as being incorrect. The related parameter is entered in **S-0-0021, IDN-list of invalid op. data for comm. Ph. 2.**

See also the functional description: "Basic parameter block"

C801 - Attributes

H1 Display : C8/01

Diag. mess.:
DE C801 Parameter-Defaultwert fehlerhaft (-> S-0-0021)
EN C801 Parameter default value erroneous (-> S-0-0021)
FR C801 Valeur de défaut pour paramètre faux (voir S-0-0021)
ES C801 Valor por defecto para parámetro defectuoso
IT C801 Parametro di Default falso (-> S-0-0021)

Mess. no.: C801 (hex)

Class: Command

C802 Locked with password

The parameter **S-0-0267, Password** offers the possibility to set a **write protection** for the drive parameters. The diagnostic message **C705 Locked with password** indicates, that the command **P-0-4094, C800 Command Base-parameter load** has been started, although the drive parameters are protected with the customer password.

See also the functional description: "Basic parameter block"

C802 - Attributes

H1 Display : C8/02

Diag. mess.:
DE C802 Verriegelt mit Passwort
EN C802 Locked with password
FR C802 Bloqué avec mot de passe
ES C802 Bloqueado con contraseña
IT C802 Bloccato con parola chiave

Mess. no.: C802 (hex)

Class: Command

D300 Command adjust commutation

Meaning:

A correctly adjusted commutation offset is mandatory for the operation of synchronous motors. The "D3“ message indicates that the command has been activated, that is used for determining the commutation offset.

Cause:

The commutation setting command has been activated.

See also the functional description: "Determining the commutation offset"

D300 - Attributes

H1 Display : d3

Diag. mess.: **DE** D300 Kommando Kommutierungseinstellung
EN D300 Command adjust commutation
FR D300 Commande Justage de commutation
ES D300 Conmutación comando
IT D300 Comando di commutazione

Mess. no.: D300 (hex)

D301 Drive not ready for commutation command

Cause with linear motor:

There must not be a controller enable signal when the command is started. However, it must be in communication phase 4 ("bb“ or "Ab“ displayed).

Cause with rotary synchronous motor:

The drive must be in torque control mode when the "D3“ command is started.

This error message is generated if those conditions are not satisfied.

Remedial action with linear motor:

Depending on the motor type, switch off the controller enable signal and start the command again.

Remedial action with rotary synchronous motor:

Activate torque control and start the command again.

See also the functional description: "Determining the commutation offset in rotary synchronous motors (MSB)"

D301 - Attributes

H1 Display : d3/01

Diag. mess.: **DE** D301 Antrieb für Komm.einstellung nicht bereit
EN D301 Drive not ready for commutation command
FR D301 Entraînement pas prêt pour justage de commutation
ES D301 Accionamiento no listo para comando conmutación
IT D301 Azionamento non Pronto per Com. di Commutazione

Mess. no.: D301 (hex)

Class: Command

D400 Positive stop drive procedure command

When the positive stop drive procedure command is activated, all controller monitoring which would result in an error message for class 1 diagnostic while blocking the drive with a positive stop is turned off.

Cause:

Command **D400 Positive stop drive procedure command** was activated.

See also the functional description: "Positive stop drive procedure"

D400 - Attributes

H1 Display : d4

Diag. mess.:
DE D400 Kommando Fahren auf Festanschlag
EN D400 Positive stop drive procedure command
FR D400 Commande Mouvement contre obstacle fixe
ES D400 Comando Desplazamiento hasta tope
IT D400 Comando Movimento contro Ostacolo fisso

Mess. no.: D400 (hex)

D401 ZKL1-Error at Command Start

Cause:

A class 1 diagnostic error was discovered while starting the command "Positive stop drive procedure" As a result, the command could not be executed.

Remedy:

Eliminate the cause of the error, clear the error, and start the command again.

See also the functional description: "Positive stop drive procedure"

D401 - Attributes

H1 Display : D4/01

Diag. mess.:
DE D401 ZKL1-Fehler beim Kommandostart
EN D401 ZKL1-Error at Command Start
FR D401 Erreur classe d'état 1 au démarrage de la commande
ES D401 Error ZKL1 en inicio de comando
IT D401 Errore Classe 1 al inizio del Comando

Mess. no.: D401 (hex)

Class: Command

D500 Command 'Get Mark Position'

Meaning:

The **P-0-0014, D500 Command determine marker position** command can be used for checking the correct acquisition and position of the reference marker of an incremental measuring system. The „d5“ display shows that the command has been activated.

Cause:

The **Determine marker position** command has been activated.

See also the functional description: "Functional principle of command detect marker position"

D500 - Attributes

H1 Display : d5

Diag. mess.:
DE D500 Kommando Markerposition erfassen
EN D500 Command 'Get Mark Position'
FR D500 Commande Obtenir la position du marqueur
ES D500 Comando 'Registrar posición de marcador'
IT D500 Comando prendere la Positione della Marca

Mess. no.: D500 (hex)

D501 Incremental encoder required

Cause:

The command has been started for a measuring system that does not possess real reference markers. These include measuring systems such as DSF, EnDat, SSI or resolver measuring systems.

Remedy:

Check whether the correct encoder has been selected in **S-0-0147, Homing parameter**.

Employ an encoder system with real reference markers.

See also the functional description: "Functional principle of command detect marker position"

D501 - Attributes

H1 Display : d5/01

Diag. mess.:
DE D501 Kein inkrementelles Meßsystem
EN D501 Incremental encoder required
FR D501 Un codeur incremental est nécessaire.
ES D501 Falta encoder incremental
IT D501 Encoder incrementale manca

Mess. no.: D501 (hex)

Class: Command

D600 Cancel reference point procedure command

Meaning:

The reference of the encoder that has been selected via **S-0-0147, Homing parameter** is canceled.

Cause:

The **D600 Cancel reference point procedure command** has been activated.

See also the functional description: "Drive-Controlled Homing"

D600 - Attributes

H1 Display : D6

Diag. mess.:
DE D600 Kommando Referenzbezug loeschen
EN D600 Cancel reference point procedure command
FR D600 Commande Annulation de l'origine
ES D600 Comando cancelar proceso de punto de referencia
IT D600 Comando Annullazione Azzeramento

Mess. no.: D600 (hex)

D700 Parking Axis Command

Meaning:

The command permits one or more drives of a drive package to be stopped without error messages being issued to the controller and/or the power supply module. The remaining drives of the package can be handled without any restrictions.

Cause:

The **S-0-0139, D700 Command parking axis** command has been activated.

See also the functional description: "Command Parking Axis"

D700 - Attributes

H1 Display : PA

Diag. mess.:
DE D700 Kommando Parkende Achse
EN D700 Parking Axis Command
FR D700 Commande Axe stationnée
ES D700 Comando eje estacionado
IT D700 Comando Stazionamento Asse

Mess. no.: D700 (hex)

1.5 Status diagnostic messages

A000 Communication phase 0

The communication process is divided into four communications phases: Phases 0 and 1 are used to recognize the participants. Phase 2 is used to provide the time and data protocols for communications phases 3 and 4.

Initialization is performed in ascending order of the sequence. The defaults of the communications phase are set by the control system. When the switch to communications phase 4 takes place, initialization is completed and input power is enabled.
If the delayed phase switch is interrupted, the status display in the communications phase which has already been reached freezes.
If diagnostic message **A000 Communication phase 0** is active, the drive is in phase 0 and is waiting for a phase transfer to 1 by the control system.

See also the functional description: "Parameter mode - operation mode"

A000 - Attributes

H1 Display : P0

Diag. mess.:
DE A000 Kommunikationsphase 0
EN A000 Communication phase 0
FR A000 Phase de communication 0
ES A000 Fase de comunicación 0
IT A000 Fase di Comunicazione 0

Mess. no.: A000 (hex)

A001 Communication phase 1

The communication process is divided into four communications phases: Phases 0 and 1 are used to recognize the participants. Phase 2 is used to provide the time and data protocols for communications phases 3 and 4.

Initialization is performed in ascending order of the sequence. The defaults of the communications phase are set by the control system. When the switch to communications phase 4 takes place, initialization is completed and input power is enabled.
If the delayed phase switch is interrupted, the status display in the communications phase which has already been reached freezes.
If diagnostic message **A001 Communication phase 1** is active, the drive is in phase 1, and transfer from phase 1 to 2 has not yet been initiated by the control system.

See also the functional description: "Parameter mode - operation mode"

A001 - Attributes

H1 Display : P1

Diag. mess.: **DE** A001 Kommunikationsphase 1
EN A001 Communication phase 1
FR A001 Phase de communication 1
ES A001 Fase de comunicación 1
IT A001 Fase di Comunicazione 1

Mess. no.: A001 (hex)

A002 Communication phase 2

The communication process is divided into four communications phases: Phases 0 and 1 are used to recognize the participants. Phase 2 is used to provide the time and data protocols for communications phases 3 and 4.

Initialization is performed in ascending order of the sequence. The defaults of the communications phase are set by the control system. When the switch to communications phase 4 takes place, initialization is completed and input power is enabled.

If the delayed phase switch is interrupted, the status display in the communications phase which has already been reached freezes. If diagnostic message **A002 Communication phase 2** is active, the drive is in phase 2.Before the control system transfers to communications phase 3, command **S-0-0127, C100 Communication phase 3 transition check** must be started. If the command is acknowledged negatively, transfer to communications phase 3 is not possible. The problems that were diagnosed by the drive must be solved first.

Note: The parameters are not checked to see if they are correct.

See also the functional description: "Parameter mode - operation mode"

A002 - Attributes

H1 Display : P2

Diag. mess.: **DE** A002 Kommunikationsphase 2
EN A002 Communication phase 2
FR A002 Phase de communication 2
ES A002 Fase de comunicación 2
IT A002 Fase di Comunicazione 2

Mess. no.: A002 (hex)

A003 Communication phase 3

The communication connection is divided into four communication phases: Phases 0 and 1 are used to recognize the participants. Phase 2 is used to provide the time and data protocols for communications phases 3 and 4.
Initialization is performed in ascending order of the sequence. The defaults of the communications phase are set by the control system. When the switch to communications phase 4 takes place, initialization is completed and input power is enabled.
If the delayed phase switch is interrupted, the status display in the communications phase which has already been reached freezes. If diagnostic message **A003 Communication phase 3** is active, the drive is in phase 3.
Before the control system transfers to communications phase 4 (operating mode), command **S-0-0128, C200 Communication phase 4 transition check** must be started. If the command is acknowledged negatively, transfer to communications phase 4 is not possible. The problems that were diagnosed by the drive must be solved first.

Note: The parameters are not checked to see if they are correct.

See also the functional description: "Parameter mode - operation mode"

A003 - Attributes

H1 Display : P3

Diag. mess.:
DE A003 Kommunikationsphase 3
EN A003 Communication phase 3
FR A003 Phase de communication 3
ES A003 Fase de comunicación 3
IT A003 Fase di Comunicazione 3

Mess. no.: A003 (hex)

A010 Drive HALT

The feature "Halt drive" was activated. The halt drive feature serves to stop the motor at a defined deceleration and a defined jerk.
This feature can either be activated by deleting the drive halt bits (BIT 13) in the master control word or by interrupting a drive control command (i.e., in drive-controlled homing).

See also the functional description: "Drive halt feature description"

A010 - Attributes

H1 Display : AH

Diag. mess.:
DE A010 Antrieb HALT
EN A010 Drive HALT
FR A010 Arrêt de l'entraînement
ES A010 Accionamiento parada
IT A010 Stop Azionamento

Mess. no.: A010 (hex)

A011 Drive Interlock open

Digital drive controllers are equipped with a starting lockout device that prevents an unwanted start of a servo axis. Activating the starting lockout device separates the power stage control electronics from the power stage via a relay contact.

+24 V is applied to the AS+; AS– terminals of the X3 connector.

See also the functional description "Drive interlock open".

A011 - Attributes

H1 Display : A5

Diag. mess.:
DE A011 Anlaufsperre aktiv
EN A011 Drive Interlock open
FR A011 Démarrage bloqué
ES A011 Bloqueo de marcha
IT

Mess. no.: A011 (hex)

A012 Control and power sections ready for operation

The drive is supplied with control voltage and the power is switched on. The drive is ready for power delivery.

See also the functional description: "Controller enable"

A012 - Attributes

H1 Display : Ab

Diag. mess.:
DE A012 Steuer- und Leistungsteil betriebsbereit
EN A012 Control and power sections ready for operation
FR A012 Commande et puissance prêts à fonctionner
ES A012 Secciones de mando y potencia listos para el servicio
IT A012 Azionamento pronto

Mess. no.: A012 (hex)

A013 Ready for Power On

The drive is supplied with a control voltage; there are no errors in the drive controller. The drive is ready to be turned on.

See also the functional description: "Parameter mode - operation mode"

A013 - Attributes

H1 Display : bb

Diag. mess.:
DE A013 Bereit zur Leistungszuschaltung
EN A013 Ready for Power On
FR A013 Prêt pour mise sous puissance
ES A013 Listo para conexión de potencia
IT A013 Sistema pronto per Inserzione Potenza

Mess. no.: A013 (hex)

A100 Drive in TORQUE control

The drive is in the torque control operating mode. It follows the torque command value sequence which was set by the control system.

See also the functional description: "Torque/force control"

A100 - Attributes

H1 Display : AF

Diag. mess.:
DE A100 Antrieb in Momentenregelung
EN A100 Drive in TORQUE control
FR A100 Entraînement en asservissement de COUPLE
ES A100 Accionamiento en regulación de PAR
IT A100 Azionamento in Regolazione di COPPIA

Mess. no.: A100 (hex)

A101 Drive in VELOCITY control

The drive is in the velocity control operating mode. It follows the velocity command value sequence set by the control system. The RPM control loop is closed in the drive.

See also the functional description: "Velocity control"

A101 - Attributes

H1 Display : AF

Diag. mess.:
DE A101 Antrieb in Geschwindigkeitsregelung
EN A101 Drive in VELOCITY control
FR A101 Entraînement en asservissement de VITESSE
ES A101 Accionamiento en regulación de VELOCIDAD
IT A101 Azionamento in Regolazione di VELOCITA

Mess. no.: A101 (hex)

A102 Position Mode with Encoder 1

The drive is in **position control mode**. The position loop is closed in the drive by a position encoder. The control system only sets the position command value sequence; the drive follows the command value with following (lag) error.

Encoder 1 indicates that the position encoder is installed on the motor shaft (indirect measurement of the axis position).

See also the functional description: "Position control"

A102 - Attributes

H1 Display : AF

Diag. mess.:
DE A102 Lageregelung mit Geber 1
EN A102 Position Mode with Encoder 1
FR A102 Asservissement de position, codeur 1
ES A102 Regulación de posición, encoder 1
IT A102 Posizionamento con Encoder 1

Mess. no.: A102 (hex)

A103 Position Mode with Encoder 2

The drive is in **position control mode**. The position loop is closed in the drive by a position encoder. The control system only sets the position command value sequence; the drive follows the command value with following (lag) error.

Encoder 2 indicates that the position encoder is installed on the machine axis (direct axis position measurement).

See also the functional description: "Position control"

A103 - Attributes

H1 Display : AF

Diag. mess.:
DE A103 Lageregelung mit Geber 2
EN A103 Position Mode with Encoder 2
FR A103 Asservissement de position, codeur 2
ES A103 Regulación de posición, encoder 2
IT A103 Posizionamento con Encoder 2

Mess. no.: A103 (hex)

A104 Position Mode lagless, Encoder 1

The drive is in **position control mode**. The position loop is closed in the drive by a position encoder. The control system only sets the position command value sequence; the drive follows the command value **without following (lag) error**.

Encoder 1 indicates that the position encoder is installed on the motor shaft (indirect measurement of axis position).

See also the functional description: "Position control"

A104 - Attributes

H1 Display : AF

Diag. mess.:
DE A104 Lageregelung schleppabstandsfrei, Geber 1
EN A104 Position Mode lagless, Encoder 1
FR A104 Asserv. de pos., codeur 1, sans erreur poursuite
ES A104 Regulación de posición, encoder 1, sin retardo
IT A104 Posizionamento con Encoder 1, senza E.I.

Mess. no.: A104 (hex)

A105 Position Control lagless, Feedback 2

The drive is in **position control mode**. The position loop is closed in the drive by a position encoder. The control system only sets the position command value sequence; the drive follows the command value **without following (lag) error**.

Encoder 2 indicates that the position encoder is installed on the machine axis (direct axis position measurement).

See also the functional description: "Position control"

A105 - Attributes

H1 Display : AF

Diag. mess.:
DE A105 Lageregelung schleppabstandsfrei, Geber 2
EN A105 Position Control lagless, Feedback 2
FR A105 Asserv. de pos., codeur 2, sans erreur poursuite
ES A105 Regulación de posición, encoder 2, sin retardo
IT A105 Posizionamento con Encoder 2, senza E.I.

Mess. no.: A105 (hex)

A106 Drive controlled interpolation, Encoder 1

The drive receives a position command value from the control system which is identical to the target position of the travel path. Then the drive generates (**interpolates**) an internal position command value sequence, which uses the control system to maintain maximum values for jerk, velocity and acceleration sequences.
The drive moves with following (lag) error to the target position of the travel path.

Encoder 1 indicates that the position encoder is installed on the motor shaft (indirect measurement of the axis position).

See also the functional description: "Drive internal interpolation"

A106 - Attributes

H1 Display : AF

Diag. mess.:
DE A106 Antriebsinterne Interpolation, Geber 1
EN A106 Drive controlled interpolation, Encoder 1
FR A106 Interpolation interne, codeur 1
ES A106 Interpolación contr. por accionamiento, encoder 1
IT A106 Azionamento contr. in Interpolazione, Encoder 1

Mess. no.: A106 (hex)

A107 Drive controlled interpolation, Encoder 2

The drive receives a position command value from the control system which is identical to the target position of the travel path. Then the drive generates (**interpolates**) an internal position command value sequence, which uses the control system to maintain maximum values for jerk, velocity and acceleration sequences.
The drive moves with following (lag) error to the target position of the travel path.

Encoder 2 indicates that the position encoder is installed on the machine axis (direct axis position measurement).

See also the functional description: "Drive internal interpolation"

A107 - Attributes

H1 Display : AF

Diag. mess.:
DE A107 Antriebsinterne Interpolation, Geber 2
EN A107 Drive controlled interpolation, Encoder 2
FR A107 Interpolation interne, codeur 2
ES A107 Interpolación contr. por accionamiento, encoder 2
IT A107 Azionamento contr. in Interpolazione, Encoder 2

Mess. no.: A107 (hex)

A108 Drive controlled interpolation, lagless, Encoder 1

The drive receives a position command value from the control system which is identical to the target position of the travel path. Then the drive generates (**interpolates**) an internal position command value sequence, which uses the control system to maintain maximum values for jerk, velocity and acceleration sequences.

The drive moves **without following error** to the target position of the travel path.

Encoder 1 indicates that the position encoder is installed on the motor shaft (indirect measurement of the axis position).

See also the functional description: "Drive internal interpolation"

A108 - Attributes

H1 Display : AF

Diag. mess.:
DE A108 Antriebsinterne Interpol. schleppfrei, Geber 1
EN A108 Drive controlled interpolation, lagless, Encoder 1
FR A108 Interpolation interne, codeur 1, sans erreur poursuite
ES A108 Interpol. por accion. int., enc. 1, sin retardo
IT A108 Azionamento contr. in Interp., Enc. 1, senza E.I.

Mess. no.: A108 (hex)

A109 Drive controlled interpolation, lagless, Encoder 2

The drive receives a position command value from the control system which is identical to the target position of the travel path. Then the drive generates (**interpolates**) an internal position command value sequence, which uses the control system to maintain maximum values for jerk, velocity and acceleration sequences.
The drive moves **without following error** to the target position of the travel path.

Encoder 2 indicates that the position encoder is installed on the machine axis (direct axis position measurement).

See also the functional description: "Drive internal interpolation"

A109 - Attributes

H1 Display : AF

Diag. mess.:
DE A109 Antriebsinterne Interpol. schleppfrei, Geber 2
EN A109 Drive controlled interpolation, lagless, Encoder 2
FR A109 Interpolation interne, codeur 2, sans erreur poursuite
ES A109 Interpol. por accion. int., enc. 2, sin retardo
IT A109 Azionamento contr. in Interp., Enc. 2, senza E.I.

Mess. no.: A109 (hex)

A146 Relative drive controlled interpolation, Encoder 1

In the **S-0-0282, Travel distance** parameter, the drive receives a distance specification from the controller. When bit 0 of the **S-0-0346, Setup flag for relative command values** parameter is toggled, this distance is summed up to the value in **S-0-0258, Target position**. In order to get from the current position to the new target position, the drive now generates (interpolates) an internal position command value curve. This is done taking the limit values of velocity, acceleration, and jerk in the parameters

- **S-0-0259, Positioning velocity**
- **S-0-0260**, **Positioning acceleration**
- **S-0-0193, Positioning jerk**

into account.

The drive approaches the target position with a position lag that is proportional to the velocity.

Encoder 1 means that the position encoder is attached to the motor shaft (indirect measurement of the axis position).

See also the functional description: "Relative drive-internal interpolation"

A146 - Attributes

H1 Display : AF

Diag. mess.:
DE A146 Relative antriebsinterne Interpolation, Geber 1
EN A146 Relative drive controlled interpolation, Encoder 1
FR A146 Interpolation interne relative, codeur 1
ES A146 Interpol. relativa contr. por accion., enc. 1
IT A146 Azionam. contr. in Interp. relativa, Enc. 1

Mess. no.: A146 (hex)

A147 Relative drive controlled interpolation, Encoder 2

In the **S-0-0282, Travel distance** parameter, the drive receives a distance specification from the controller. When bit 0 of the **S-0-0346, Setup flag for relative command values** parameter is toggled, this distance is summed up to the value in **S-0-0258, Target position**. In order to get from the current position to the new target position, the drive now generates (interpolates) an internal position command value curve. This is done taking the limit values of velocity, acceleration, and jerk in the parameters

- **S-0-0259, Positioning velocity**
- **S-0-0260**, **Positioning acceleration**
- **S-0-0193, Positioning jerk**

The drive approaches the target position with a position lag that is proportional to the velocity.

Encoder 2 means that the position encoder that is attached to the load is used for closing the position control loop (direct axis position measurement).

See also the functional description: "Relative drive-internal interpolation"

A147 - Attributes

H1 Display :		AF
Diag. mess.:	**DE**	A147 Relative antriebsinterne Interpolation, Geber 2
	EN	A147 Relative drive controlled interpolation, Encoder 2
	FR	A147 Interpolation interne relative, codeur 2
	ES	A147 Interpol. relativa contr. por accion., enc. 2
	IT	A147 Azionam. contr. in Interp. relativa, Enc. 2
Mess. no.:		A147 (hex)

A148 Relative drive contr. interpolation, Enc. 1, lagless

In the **S-0-0282, Travel distance** parameter, the drive receives a distance specification from the controller. When bit 0 of the **S-0-0346, Setup flag for relative command values** parameter is toggled, this distance is summed up to the value in **S-0-0258, Target position**. In order to get from the current position to the new target position, the drive now generates (interpolates) an internal position command value curve. This is done taking the limit values of velocity, acceleration, and jerk in the parameters

- **S-0-0259, Positioning velocity**
- **S-0-0260**, **Positioning acceleration**
- **S-0-0193, Positioning jerk**

into account.

The drive approaches the target position of the travel path without a position lag.

Encoder 1 means that the position encoder is attached to the motor shaft (indirect measurement of the axis position).

See also the functional description: "Relative drive-internal interpolation"

A148 - Attributes

H1 Display : AF

Diag. mess.:
DE A148 Relative antriebsint. Interpol. Geber 1, schleppfrei
EN A148 Relative drive contr. interpolation, Enc. 1, lagless
FR A148 Interpol. interne relative, cod. 1, sans err. pste.
ES A148 Interpol. rel. por accion. int., enc. 1, sin retardo
IT A148 Azionam. contr. in Interp. relat., Enc. 1, senza E.I.

Mess. no.: A148 (hex)

A149 Relative drive contr. interpolation, Enc. 2, lagless

In the **S-0-0282, Travel distance** parameter, the drive receives a distance specification from the controller. When bit 0 of the **S-0-0346, Setup flag for relative command values** parameter is toggled, this distance is summed up to the value in **S-0-0258, Target position**. In order to get from the current position to the new target position, the drive now generates (interpolates) an internal position command value curve. This is done taking the limit values of velocity, acceleration, and jerk in the parameters

- **S-0-0259, Positioning velocity**
- **S-0-0260**, **Positioning acceleration**
- **S-0-0193, Positioning jerk**

The drive approaches the target position of the travel path without a position lag.

Encoder 2 means that the position encoder that is attached to the load is used for closing the position control loop (direct axis position measurement).

See also the functional description: "Relative drive-internal interpolation"

A149 - Attributes

H1 Display : AF

Diag. mess.:
DE A149 Relative antriebsint. Interpol. Geber 2, schleppfrei
EN A149 Relative drive contr. interpolation, Enc. 2, lagless
FR A149 Interpol. interne relative, cod. 1, sans err. pste.
ES A149 Interpol. rel. por accion. int., enc. 2, sin retardo
IT A149 Azionam. contr. in Interp. relat., Enc. 2, senza E.I.

Mess. no.: A149 (hex)

A800 Unknown Operation Mode

There is no diagnosis for the activated mode.

A800 - Attributes

H1 Display : AF

Diag. mess.:
DE A800 Unbekannte Betriebsart
EN A800 Unknown Operation Mode
FR A800 Mode d'opération inconnu
ES A800 Modo de operación desconocido
IT A800 Modo operativo non conosciuto

Mess. no.: A800 (hex)

1.6 Diagnostic messages for basic initialization and after fatal System errors

Diagnostic Message Display: -0

Cause:

The data storage for the controller is tested for its functional capability.

If an error is detected, this display will remain.

Remedy:

The drive controller is defective (DRP3) and must be exchanged.

Diagnostic Message Display: -1

Cause:

The data storage for the DSS 2.1 Module is tested for its functional capability.

If an error is detected, this display will remain.

Remedy:

The DSS Module or the connection to the main device is defective.

- If DSS module is defective > exchange
- If drive controller is defective > exchange

Diagnostic Message Display: -2

Cause:

Makeup of the parameter structure.

If the EPROMS are exchanged for another version of the firmware, the parameter memory on the programming module is erased (duration appx. 5 sec.).

Diagnostic Message Display: -3

Cause:

The motor type and the type of the motor feedback are determined by reading their parameter storage areas.

Diagnostic Message Display: -5

During basic initialization, an error was reported by the coprocessor.

Cause:

1. Control voltage error (+24 V or +/-15 V).
2. +/-10 V - error.

Remedy:

For 1. Check the control voltage supply.

For 2. Replace the drive.

Diagnostic Message Display: -6

Cause:

A fatal processor or program error was encountered.

Remedy:

The error in question is a system error. Please contact the appropriate software development company.

Diagnostic Message Display: Watchdog

Cause:

A fatal processor or program error (Watchdog) was encountered.

Remedy:

Replace the drive.

1.7 Operation Status

bb

"read for operation"

The drive is ready to be turned on.

Diagnostic message text:

Ready to be turned on (ready for operation)

Ab

"Drive is ready"

The control and power components of the drive are ready for operation.

Diagnostic message text:

Control and power components are ready (drive is ready)

AF

"Drive enable"

The drive enable was issued and operated the activation of the drive. This follows a command value input.

Diagnostic message text:

according to selected operating mode.

AS

"Drive interlock"

The power output was locked. This signal serves the secured torque free switching of the drive independent from existing operating states of the drive packs.

Diagnostic message text:

Drive interlock

AH

"Drive Halt"

The drive will be stopped under the conditions of the acceleration parameter and stays in control.

P0

Phase 0

The drive is in phase 0 and is waiting on the phase transition from phase 0 to phase 1.

Diagnostic message text:

Phase 0

P1

Phase 1

The transition from phase 1 to phase 2 was still not initiated from the control system.

Remedy:

see the control handbook

P2

Phase 2

Before the control system switches in the communications phase 3, the controller checks inputted parameters for content of the input limits and for completeness. If invalid parameter values were found, the phase progression switch will stop the drive.

Note: The parameters are not checked for exactness.

Remedy:

In the parameter "Identification Number List Invalid Operating Data Communications Phase 2", the ID numbers S-0-0021 are recorded which were recognized as invalid from the drive before the phase progression switch in communications phase 3. The completion of this parameter is required in order for switching into communications phase 3.

P3

Phase 3

Before the control system switches in the communications phase 4, the controller checks inputted parameters for content of the input limits and for completeness. If invalid parameter values are recognized, the phase progression switch will be stopped by the controller.

Note: The parameters are not checked for exactness.

Remedy:

In the parameter "ID Number Lists of Invalid Operating Data Communications Phase 3", ID number S-0-0022 records the parameters which were recognized as invalid by the drive before the phase progression switch in communications phase 4. The completion of this parameter is required in order for switching into communications phase 4.

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